ELECTRICAL REVIEW

ILLUSTRATED

A Weekly Journal of

ELECTRIC LIGHT AND POWER, TELEGRAPH, TELEPHONE & SCIENTIFIC PROGRESS.

Vol. 13, No. 6.
October 6, 1888.

NEW YORK, U.S.A.

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Electric Light, Power, Telephone, Telegraph and Scientific Progress.

VOL. 13, No. 6. WEEKLY. | NEW YORK, SATURDAY, OCTOBER 6, 1888. | $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

The Edmunds' System of Electrical Distribution.

We get the following from Mr. Henry Edmunds' remarks in relation to his system of electrical distribution, which is, he states, essentially different in every point from any of the plans hitherto tried or in operation at the present time:

A number of groups of cells, which we will call the local batteries, are placed at different points or centers where supply is

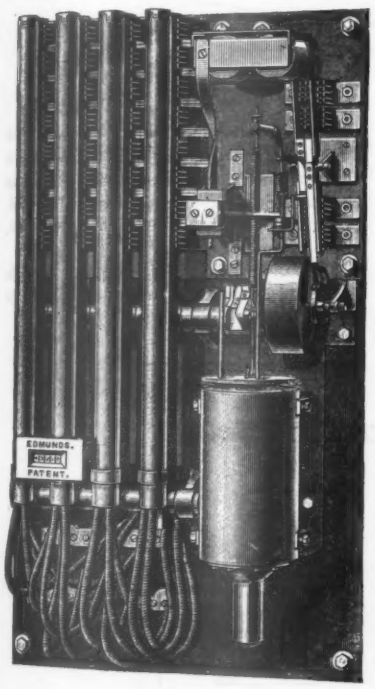
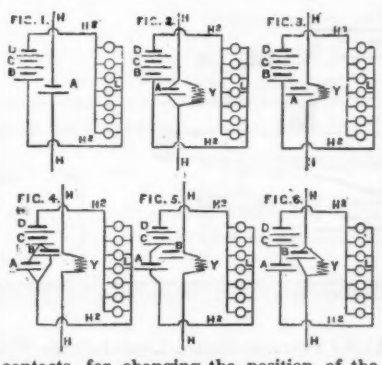


FIG. 1.—THE EDMUNDS' DISTRIBUTOR.

required in the district, each battery having its individual number of cells according to the voltage required locally, and the amount of current to be supplied. Unlike the Brush method, these local batteries are electrically distinct and independent of each other and of the charging main, neither is there a duplicate set to be changed as at Colchester, but instead, we employ an additional group with each of the local batteries, which we will term the main batteries, the number of cells of which are a divisor of the number employed locally—generally one-third. For example, suppose the local voltage be 48 volts, 32 cells would be employed which we would subdivide into four groups, eight cells in each, and for purposes of identification we will call these groups *a*, *b*, *c*, and *d* respectively. Groups *b*, *c* and *d* are connected in series in the local (see diagram) giving 48 volts. Group *a*, being in the main, being charged for a limited period of time—in practice two minutes—is then removed from the main charging circuit and placed in the local discharging circuit, when say group *b* is removed from the local into the main to be charged. *b* now in turn exchanges places with *c*, and *c* with *d*, so that each group *a*, *b*, *c*, *d*, follow each other in turn from the main to the local or local to main, whereby in every eight minutes each group has received its increment of charge from the main and has supplied the same in turn to the local, and so on continuously, until in 24 hours each group has received its full charge of current, enabling the battery to maintain its maximum discharge for eight hours. The current employed in practice being 70 amperes, and the size of cells proportionate. Incidentally we find many advantages due to charging cells in this manner. We can maintain a constant potential on the local circuit, so that we have not the interference and fluctuation due to charging and discharging at the same time. The high tension main is never at any time in electrical contact with the local circuit, thereby freeing the system from leakage to earth and its attendant danger. Also the cells are kept in much better condition by continually receiving short increments of charge and having periods of rest from discharge. The loss due to difference of potential between the charging and discharging current is minimized, it being found in practice we can continue charging the cell to its maximum capacity with a mean voltage of 2.25, instead of 2.5 per cell as is required, where cells are charged continuously. This, on a large scale, is a considerable element of economy, where there are a number of cells in the charging main. Also, we find that an approximately constant potential on the local circuit enables us to run lamps at a higher efficiency, without the risk of rupture due to sudden rises of pressure; and so far as we can judge the life of the batteries is considerably lengthened by this mode of intermittent charge and rest. And in addition to all these advantages we have a great saving in the generating station in cost of plant, only one-third the power being required to operate the same number of lights for eight hours, that would be necessary for any direct system, and much less electric force or pressure on the charging mains to supply the same number of lamps, thereby saving cost of installation and chance of leakage.

The additional advantage of being able to run a smaller station for 24 hours in the day is obvious, as we do not have any idle plant with interest thereon. The current being always constant in volume enables a single main of one size throughout to be used, preventing complications and only requiring increase of pressure as the work extends, which pressure would be only one-third the Brush or Colchester systems referred to, for the same number of cells in the local centers, or could at their pressure charge three times the number of batteries. For example, where batteries are used in 100 centers on the Brush or Colchester plan, each center giving 50 volts, requiring at the station a charging potential of over 5,600 volts exclusive of the line, while with the distributor plan it would only require a charging potential of under 2,000 volts for the same work.

The apparatus for carrying out this system, I call a distributor—it combines in one instrument a time mechanism causing changes to occur at regular periods of say two minutes, by energizing an electro-magnet at each period, rotating a shaft carrying cams that cause levers to make the necessary



contacts for changing the position of the cells from local to charge, and *vice versa*; a polarized switch, whereby the current is prevented from entering the batteries in the wrong direction, and a voltage regulator which causes the batteries as a whole to cut themselves out of the charging main or otherwise, according to their being fully charged, or requiring charge. A simple form of meter registering the current is supplied. The diagram of the cycles of operation will explain what takes place, and I have constructed several distinct instruments for effecting these cycles, some with levers and mercury contacts, one with rotary brush contacts like a compound commutator, and the one shown in cut, which we are now using, in the designing of which I have received great help from my assistant engineer, Mr. Albert Howard.

The manner of effecting the cycles is explained by diagrams 1 to 6 A. B, C, and D represent the accumulators at one point of lighting, which are divided into four equal groups. For instance, imagine there are 32 cells in one house, then A group would consist of 8 cells connected together in series, and B, C and D the same.

In diagram 1, A is receiving a charge from the central station, over the main cable, B, and batteries B, C and D are connected together in series, and furnishing current to the lights, B. After this state of discharge has been in operation for a fixed interval of time, the distributor begins to work automatically, and makes the various connections necessary, as follows:

Fig. 2. A resistance, I, has been switched into the main circuit in parallel with battery A.

Fig. 3. A has been switched entirely out of circuit, leaving the main current of 70 amperes, which have never been interrupted, flowing through the resistance, Y.

Fig. 4. A has been switched into parallel with B, in the local or discharge circuit. This is done without the slightest alteration in the lights, as the electromotive force remains the same as before.

Fig. 5. B has been cut out from the discharge circuit, leaving the lights on to A, C and D.

Fig. 6. B has been connected into the main charging circuit in parallel with the resistance, Y

The resistance, Y, is then disconnected, leaving the charging current flowing through B, which receives a charge for the fixed interval of time, and is then switched back into the local circuit, while C receives its increscent of charge. In this way each section of the batteries passes through equal periods of charge and discharge.

The time occupied in the mechanical movements of the entire cycle is three-quarters of a second, and the period during which the charge is on can be varied at will.

Such a system as I have briefly described lends itself to many purposes in connection with electricity supply. For instance, in the working of railroad switches and signals, electrically, a distribution at each block station would enable a whole line of rail, say 200 miles, to be supplied from one source, the pressure on the main being only a small fraction of the sum of the local pressure; or, in electric tramway work, a charged main, well insulated, of high pressure, could supply a number of points *en route*, which in turn could each, independently of the other, supply large volume low pressure currents locally—saving risk of breakdown and consequent interruption of traffic.

Fire Signal Transmitter.

The illustration presented on this page is of a new signal transmitter of the New Haven Clock Company. With it, when a district fire call has been received, the information can be at once transmitted to fire headquarters, locating the fire alarm box of the district where the fire has broken out. The box shown is furnished with six or more brake wheels which correspond in numbers with the street fire boxes. The transmitter, besides, possesses a number of improvements in detail that make it a particularly reliable and valuable appliance.

NEW FIRE SIGNAL TRANSMITTER.

The Undergrounding of Wires Should Proceed Slowly.

For several weeks past workmen in the employ of the New York and New Jersey Telephone Company have been engaged in parts of the down-town streets in removing old cables from the conduits and replacing them with new ones. It was said that the cables, or rather the tubes in which the wires had been placed, were corroded to such an extent as to be quite useless. Inquiries at telephone headquarters in Brooklyn confirmed the truth of this statement. William D. Sargent, general manager of the New York and New Jersey Telephone Company, a thoroughly well informed man, said:

"One of the cables we have taken up was covered with pure lead. It had been down only two years, yet you see (showing a section of it) it is completely honeycombed. This other one had been down four years, and was also covered with pure lead. It is now, you see, as thin as an ordinary sheet of paper, and has holes in it, so that it is quite useless as a covering for the wires. As to the cause of this corrosion, why water gas in combination with moist air will always attack and destroy pure lead. When the fight about underground wires was going on in the Legislature, this was one of the things that we predicted. It is unreasoning and unreasonable, this cry for the instant placing of all wires underground, for we can't now get them on any poles, even in country villages or country lanes. We knew the difficulty all the time."

Mr. Sargent, however, explained that he did not consider the underground wire system a failure, and was ready to continue putting the wires underneath the surface. Even if that good work be kept up, he said the city of Brooklyn would still use the poles for Fire Department and Police telegraph and telephone purposes. In speaking of the present telephone service of the country, he said improvements were being effected every day; metallic circuits between important points, which would do away with "cross talk" on the wire, and much incidental blasphemy, were being introduced, and communication with distant cities was being secured.

The Rice Engine in the U. S. Lighting Company's Station, Buffalo.

The accompanying engine cut represents the Rice automatic compound condensing engine as built by the John T. Noye Manufacturing Company, of Buffalo, N. Y., for the United States Electric Light and Power Company of the same city. The entire power plant was furnished by the John T. Noye Manufacturing Company, and has been in operation now for some little time. The engine is of 300 horse-power and is supplied with a Rice inter-heater between the high and low pressure cylinders, which, as shown in the cut, is placed above the engine, so as to drain back into the boilers. It is in reality a small boiler. The exhaust steam from the high pressure cylinder passes through the tubes, while the body or shell of the heater is in continual connection with the live steam in the boilers. By this means the water of condensation produced in the high pressure cylinder is revaporized and the exhaust steam given new strength and heat. This adds very materially to the efficiency of the engine and produces an increase in economy of ten per cent. or more. The heater, its connections and the cylinders themselves are all covered with an asbestos cement varying from an inch and a half to two inches in thickness. This, however, is not shown in the cut, the inter-heater being shown bare.

The engine itself consists, practically, of two separate engines, each with its own independent valve and governor; the only part in common being the main shaft with a crank-disk on each end and the band-wheel in the center. The cylinders are 14" and 28" bore and 30" stroke; revolutions, 150 per minute.

The valves and governors are so arranged that each engine takes its due proportion of steam, irrespective of the other. This gives the engine a great advantage, not only in economy, but in regulation as well. Furthermore, the steam connections are so made that should one-half of the engine become disabled from one cause or another, the other half may be used to temporarily carry the load while the necessary repairs are being made. The cranks are set quartering, which adds another advantage toward smooth running to those already possessed by the single cylinder engine.

The working parts are all on the outside, which makes them easy of access, always in plain sight, and permits the belt to run back between the cylinder, thus gaining distance between belt centers and economizing floor space.

As in the standard single Rice engine, the oilers are all stationary, and accessible from the outside, so that the lubrication can at any time be adjusted to suit the immediate requirements. The main bearings, crank pins and cross-heads are all supplied with interchangeable Babbitt liners cast in an iron mould, which makes each one a duplicate of every other one, and enables the engineer to make a change of liners in an hour, where otherwise it would require at least ten times that length of time.

The condition of the steam in the inter-heater is observed and controlled by pressure and vacuum gauges and pop safety and reducing valves. These latter being merely to guard the low pressure cylinder from a pressure in excess of that which it is calculated to sustain. As a relief from water, the low-pressure cylinder is provided with snifting valves set to open at about 50 pounds pressure, while the high-pressure cylinder has the regular self-relieving valve used on the standard Rice engines.

This appears on the whole to be a very compact and conveniently arranged station, capable of doing a maximum of work with a minimum of cost, and reflects credit upon all concerned in its installation. It is in charge of Superintendent Little, of the U. S. Co., a very capable and efficient electrician, and pleasant gentleman.

The engine at the United States Electric Light and Power Company's station has now been running some little time, and it is said to be giving entire satisfaction. The cut above shows a floor-plan of this station.

The condenser is placed below the engine room floor, and is of the well-known Worthington independent duplex type. It is handled entirely from above.

The steam for driving the condenser pumps, and also for the feed pump, is ex-

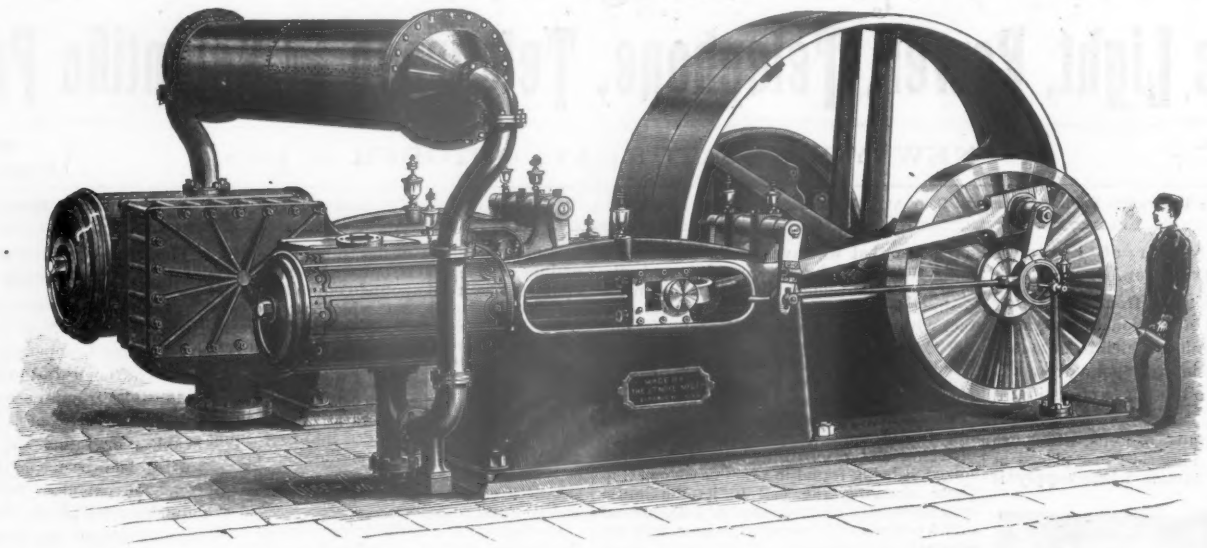


FIG. 1.—300 H. P. RICE AUTOMATIC COMPOUND CONDENSING ENGINE.

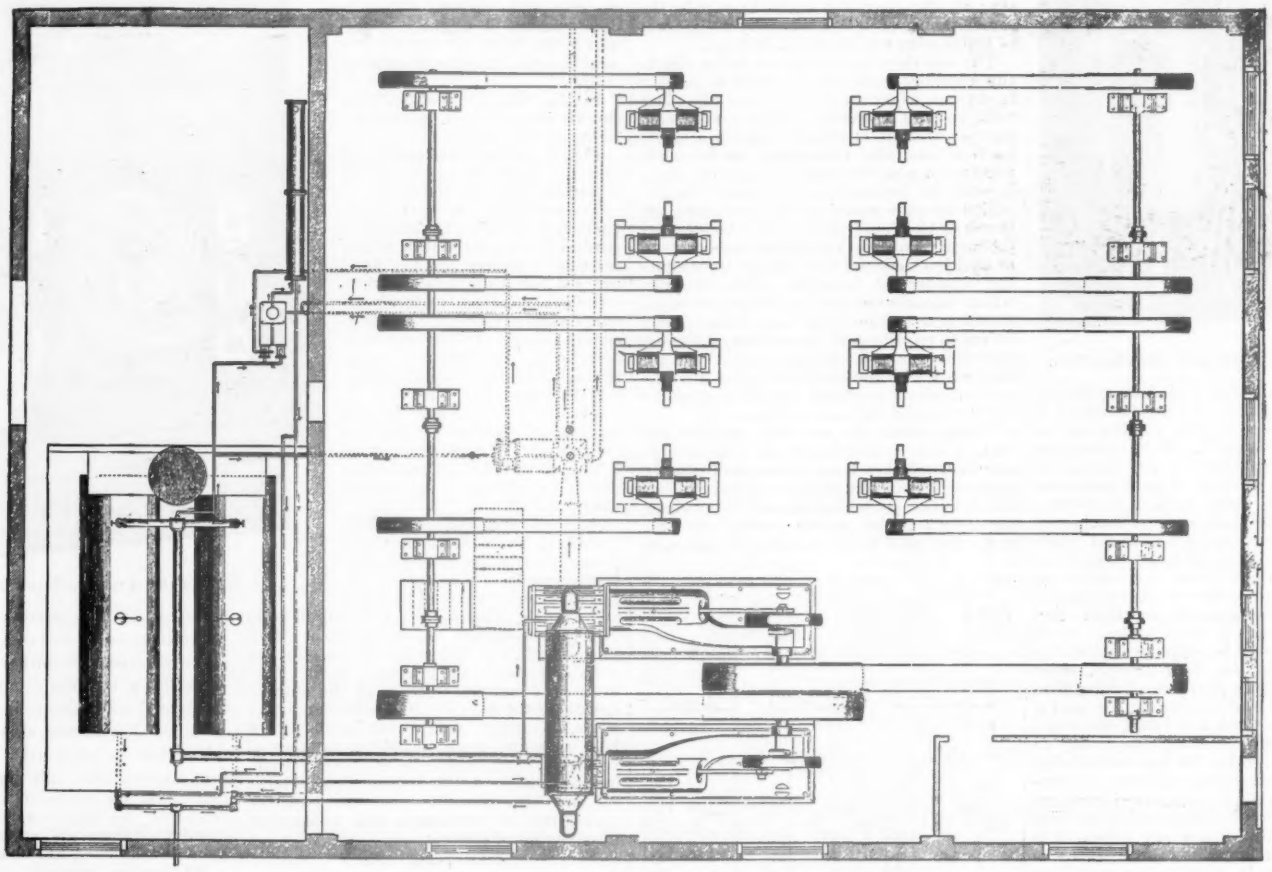


FIG. 2.—PLAN OF POWER AND DYNAMO PLANT, AT BUFFALO ELECTRIC LIGHT (U. S.) STATION—Dotted Lines Indicate Worthington Condenser Beneath the Floor.

hausted into a high pressure heater, where it is entirely condensed in heating the feed water on its way from the hot well to the boilers; almost all of the heat taken from the boiler to drive these pumps being in this way returned to the boiler.

These engines are well adapted to large

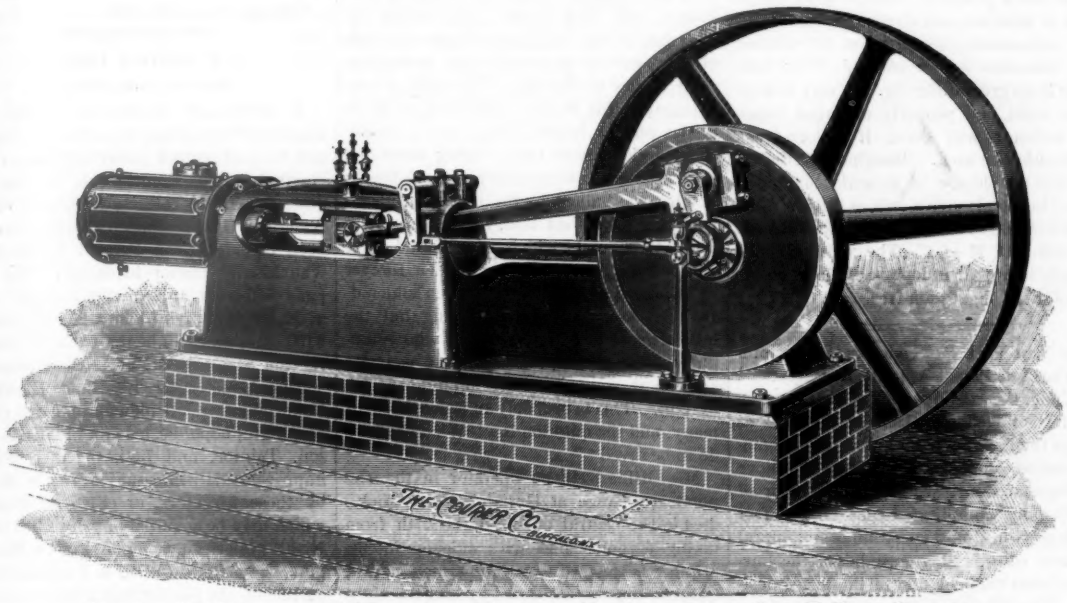


FIG. 3.—RICE ENGINE FOR ELECTRIC LIGHT PURPOSES, MANUFACTURED BY JOHN T. NOYE, BUFFALO.

mills and factories where the cost of fuel forms a large item of expense; and in these times of close figuring it is absolutely necessary to cut down the daily expenses to the lowest possible point. The Jno. T. Noye Manufacturing Company have already received a number of orders for these engines, which, in addition to the growing demand for their well-known standard Rice automatic engines, have crowded their works to the utmost of their present facilities.

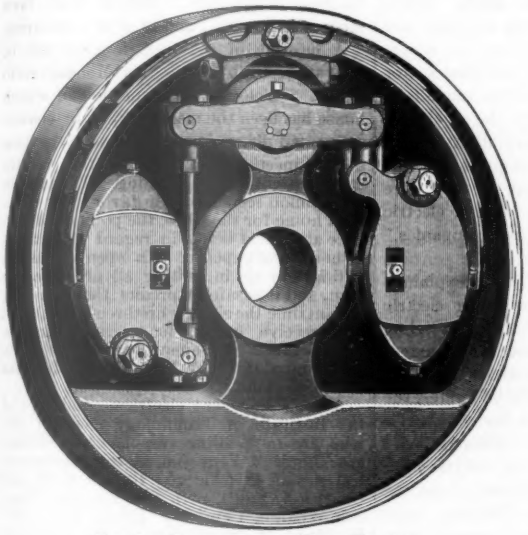


FIG 4.—GOVERNOR OF RICE ENGINE.

An Electric Light Plant Wrecked.

At Waupaca, Wis., September 17th, high water carried out the electric light dam and buildings. The latter were carried down the river 100 rods, and lodged against a flouring mill and dam, but fortunately did little damage. The dynamos went to the bottom of the river, and the damage to them cannot be estimated until they are taken out. The loss will not fall short of $3,000, and may reach double that amount. This is the second time the dam has been carried out this year. The city will be without lights for several weeks.

—— The Brush Electric Company, of Cleveland, Ohio, have recently sold to Woods, Jenks & Company, of Cleveland, Ohio, a 30 light 2,000 c. p. dynamo with a full complement of lamps. The same firm recently purchased from the Brush Company a large incandescent electric light plant consisting of three or four hundred incandescent lights.

The Electric Lights on the Brooklyn Bridge.

Acting Attorney General Maury has instructed United States District Attorney Walker, of New York, to take the necessary legal steps to compel the trustees of the New York and Brooklyn Bridge to comply with the law relative to the lighting of bridges over navigable rivers, etc. It is stated at the Lighthouse Board that the bridge company will be required to expose the usual red and green signal lights, and do away with all false lights which interfere in any way with the regulation lights considered necessary to the safe navigation of the river. The electric lights now on the bridge, will, it is said, interfere with these lights, and will have to be removed unless they are arranged, by shading or otherwise, so that their rays shall not so interfere. It seems a great pity to have to spoil the magnificent spectacle presented every night when the bridge is lighted up with its crescent of brilliant arc lights.

A Handsome Souvenir.

The photographs of the attendants at the last clam bake of the American Electrical Works are now being received. In addition to presenting the figures of the clam eaters in more or less artistic pose, the margin of the photograph is covered with the names of the attendants, handsome engravings of the Koh-i-noors presented President Phillips and Secretary Sawyer, and the "log" of the steamer "Catskill," with names of officers and crew.

This is probably the most interesting souvenir group ever taken at the clam bake, and the attendance was the largest.

Norwich, N. Y.—The Norwich Light and Power Company, Norwich, N. Y.; capital, $25,000; Dudley Farlin and others, incorporators.

Value of the World's Railroads.

The railroads of the world are, to-day, worth from twenty-five to thirty thousand million dollars. This probably represents one-tenth of the total wealth of civilized nations, and one-quarter if not one-third of their invested capital. It is doubtful whether the aggregate plant used in all manufacturing industries can equal it in value. The capital engaged in banking is but a trifle beside it. The world's whole stock of money of every kind—gold, silver and paper—would purchase only a third of its railroads.

Yet these facts by no means measure the whole importance of the railroad in the modern industrial system. The business methods of to-day are in one sense the direct result of improved means of transportation. The railroad enables the large establishment to reach the markets of the world with its products; it enables the large city to receive its food supplies, if necessary, from a distance of hundreds or thousands of miles. And while it thus favors the concentration of capital, it is in itself an extreme type of this concentration. Almost every distinctive feature of modern business, whether good or bad, finds in railroad history at once its chief cause and its fullest development.—From "The Railroad in its Business Relations," by Prof. Arthur T. Hadley, in the October *Scribner's*.

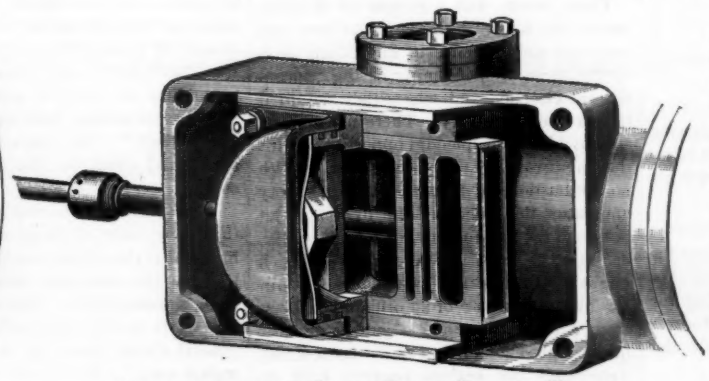
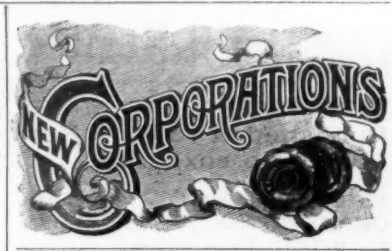


FIG. 5.—SECTION OF STEAM CHEST, SHOWING VALVE.

—— The Syracuse Electric Light and Power Company held its annual meeting last week, when John Dunn, Jr., H. L. Duguid, M. C. Palmer, W. Allen Butler, John C. Keefe, John Lyman, and Bruce S. Aldrich, were elected trustees; John Dunn, Jr., president; W. A. Butler, vice-president; M. C. Palmer, treasurer; and John C. Keefe, secretary, were re-elected.

Chicago, Ill.—The Wisconsin Lead and Zinc Company, at Chicago; capital stock, $1,000,000; for mining and manufacturing in Illinois, Wisconsin and Iowa; incorporators, John M. Cameron, William W. Evans and Edward P. Atfield.



Brooklyn, N. Y.—The Brooklyn Auxiliary Fire Alarm Company; capital, $300,000.

Syracuse, N. Y.—The Jordan Electric Light and Power Company; capital stock, $10,000.

White Plains, N. Y.—The White Plains Electric Light Company, of White Plains; capital, $20,000.

Xenia, O.—The Xenia Electric Light Company, of Xenia; capital stock, $10,000; H. C. Hardy and others, incorporators.

Tarentum, Pa.—The Tarentum Electric Light Company, of Tarentum; capital stock, $5,000; R. A. Travis and others, incorporators.

Adrian City, Mich.—The Electric Belt Railway Company; capital stock, $50,000; Mark E. Chittenden and others, incorporators.

Ashland, Ky.—The United States Incandescent Gas Lamp Co., Ashland, Ky.; capital, $100,000; Wm. Londerrach and others, incorporators.

Glenwood Springs, Col.—The Glenwood Light and Water Co., Glenwood Springs, Col.; capital, $250,000; Walter B. Devereux and others, incorporators.

Mohawk, Herkimer Co., N. Y.—The Electrical Spectacle Eye-Glass Manufacturing Company, of Mohawk, Herkimer County, has filed a preliminary certificate.

Chicago, Ill.—The Chicago Combustion and Power Company; capital stock, $200,000; incorporators, Richard B. Jones, Douglas S. Dow and Robert Linn.

Snohomish, W. T.—Electric Light Company; capital stock, $8,600. The incorporators are E. C. Ferguson, T. Ferguson, C. H. Stickles, I. Cathcart, and others.

Chicago, Ill.—The Archer Electric Belt and Battery Company, at Chicago; capital stock, $3,000; for the manufacture of electric appliances; incorporators, E. A. Hutchins, W. P. Bullard and C. S. Burton.

Milwaukee, Wis.—The McGinnis Smoke Burner and Fuel Saver Company, of Milwaukee; capital of $25,000; the incorporators are George L. Graves, William Wood, Edward A. Wadhams and George F. O'Neil.

San Francisco, Cal.—The Colby Pacific Testing Machine Company, with E. Brunswick, August Helbing, C. Beyfuss, L. G. Skancke and L. A. Robertson as directors, and with a capital stock of $1,000,000, $54,500 of which has been subscribed.

Santa Rosa, Cal.—The Santa Rosa, Cal., Lighting Company, to build gas and electric light works, and sell fuel in and about Santa Rosa; capital stock, $100,000. J. M. Livingston, W. B. Cline, Joseph Hutchinson, and C. O. G. and H. M. A. Miller, of Oakland, as the directors.

Milwaukee, Wis.—The Milwaukee Brass and Copper Works, of Milwaukee; capital, $100,000; incorporators, Jas. H. Thompson, Frank G. Bigelow, William Plankinton, Frederick T. Day, Benjamin M. Weil, Henry C. Payne, Edward H. Brodhead, George N. Sceets and John G. Thompson.

Baltimore, Md.—The John A. Barrett Battery Company. The incorporators are Charles Williams, Claude Van Bibber, George Franke, Rush T. Barrett and Daniel Maur. The purposes of the company are the manufacture of electrical batteries and other electrical appliances. The capital stock is $75,000.

ELECTRICAL REVIEW

Published at 13 Park Row
P. O. BOX 3329.

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REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.
TELEPHONE CALL, 546 JOHN.

Timothy W. Sprague, Room 58, No. 178 Devonshire Street, is our representative at Boston, Mass.
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NEW YORK, OCT. 6, 1888.

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Notwithstanding the apparently enormous growth of electric lighting in this country, it still seems as if it were only beginning now to grow in earnest. Like the first introduction of gas—the more light people get the more they want.

Possibly the day may come—or rather the night—when there will be no darkness. We may have our local suns to illumine the sky and the streets like daylight. and forever do away with the man of masks, jimmies and aliases, the enterprising burglar.

Mr. Walter P. Phillips has retired from *The Electric Age*, and Mr. John B. Taltavall again resumes the proprietorship. Mr. Phillips, as manager of the United Press, found his time too thoroughly occupied to give proper attention to editorial duties.

The noble little band of telegraphers who have remained at their post in the yellow fever stricken city of Jacksonville, Fla., is deserving of all praise. They are made of the stuff that heroes are, and deserve substantial recognition, for without them the world would have been left in ignorance of the terrible situation in the stricken city.

Are our railway trains generators of electricity? "Observer's" curious statement, given elsewhere in our columns this week, is worth perusal. Certainly the windows of passenger coaches and sleeping cars get dirty very quickly, and a possible electrified condition, continually renewed, would account for it. We would like to hear from some of our readers on the subject.

Editor A. N. Brice, of the Sunbury, Pa., *News*, is a gentleman of excellent judgment and discernment. He remarks editorially: "The ELECTRICAL REVIEW, published at 13 Park Row, New York, is certainly a wonderful journal. It is brimful of meat and the choice cream of all that is doing in the world of electricity. It is hard to keep pace with the wonders in modern improvement. We are almost prepared for anything. Any one receiving the REVIEW will not only be surprised, but pleased and educated."

Why do not some of the stereopticon engineers avail themselves of our cloudy nights, use a powerful electric light and a prism or reflector, and startle the community into enthusiastic appreciation by writing their bon-mots *on the clouds?* Why not? There is no great difficulty. A very powerful arc light, and properly arranged lenses and reflector will do it, if a deep-focus combination be used. Imagine the effect if a million people saw in gigantic characters across the clouds such words as "BEWARE OF PROTECTION!" or "FREE TRADE LEADS TO H—L!" The writing could be made to appear in letters of fiery color. We offer the suggestion free.

The New York *Sun* endorses the idea of a new Court of Patent Appeals, and says:

"Under the existing practice, the Supreme Court is obliged to determine the facts as well as the law in a patent case. The establishment of a new court, which will relieve the Supreme Court justices of the labor of deciding the complicated questions of fact which arise on almost every important appeal in patent cases, will greatly lessen the burdens of that tribunal, and facilitate its business. The Court of Patent Appeals is to consist of three judges at a salary of $6,000 a year each. This compensation is inadequate. The salary should be $10,000 if a court of the first rank is to be created. Lawyers of the requisite ability and standing, unless they are already rich men, can hardly be induced to accept the appointment for a lower compensation than this."

JUST TO WAKE UP THE ARTISTS.

There never was a system of lighting where the house decorator, furnisher and artist had such promise of fine effects as is offered them by that known as the "incandescent electric," and where they acquitted themselves so shabbily. There never was a system with such splendid opportunities for the handiwork of the glass-blower. With no combustion, no ruinous gases, no sooty apparatus, this delicate little light may jut out from the finest chintz, or velvet, or silk, or satin, or lace. With perfect safety it might crown the carved woodwork of a mirror like an aureole or an oriflamme; blaze from a stuccoed ceiling a galaxy of stars, illume a glass inlaid wall as the dawn of day o'erspreads the eastern heavens with its roseate breath. With half the art the glass-blower is capable of, a garland of delicately petaled flowers, with attenuated lights concealed, might vie with the flowers of the field in all but fragrance.

Yet, even at this late day, when the possibilities of the incandescent electric light have been long known, how are they taken advantage of? Plain ground glass globes, with here and there a clumsy imitation of a floral perianth or a corolla within its calyx. There are some others, but they are crude, generally ugly, and always unnatural. Mr. Steele Mackaye, the dramatist, with only a dim idea of the possibilities of this little light, but with the true artist's instincts withal, has come nearer to the ideal than many of these glass artisans with all their vaunted art. It was several years ago, and the decorators were at work in the then new Lyceum Theatre in Fourth avenue. They were not getting the effects with the incandescent light he had hoped for, and, thinking of the matter over night, he, with the originality that belongs to him, hit upon a promising idea. Early one morning he went down to Fulton Market and bought some bull's bladders—he never explained why cow's or sheep's or goat's bladders wouldn't do—and these cut up in small squares, he had stretched across the little lights sunk into the walls and ceilings, with delicate colored glass between. The result was surprising, for, when night was come, opalescent lights of white and bluish and yellowish white shown down, with all those delicate tints of blue and green and yellow and red that is thrown out through the fissures of the noble opal. If a dramatist can do this, surely our artists in glass ought to be able to get even finer effects. Why don't they try?

OUR CHICAGO LETTER.

(Special Correspondence.)

Here's a bone for electrical crows to peck at. Given a job of wiring for an incandescent plant, where the owner desires to have the work done as cheaply as possible, and, in furtherance of that idea, gives the contract to a bell hanger. The bell hanger's man knows only bell work, and makes all his joints of the bell hanger form—an inch of two strands of naked wire twisted at right angles to the line. To make a neat appearance this is then bent back, so as to lie flat on the braided wire, and is finally covered nicely with tape. Being concealed work, the question naturally presents itself: "What was gained by the use of insulated wire?" More than that, in the case mentioned these joints, which, when found, were within a few hours of being hidden forever by laths and plaster, were not even soldered. In the case mentioned, nothing but the inborn honesty of the architect, who voluntarily asked a competent party to examine and report, would have ever brought the job to light. This is probably an isolated case of many, and the question is: "What shall we do to be saved?"

Miss Millie Ketz, an operator in the telephone exchange at Grand Rapids, Mich., died in the central office on the 27th from taking carbolic acid with suicidal intent. Millie was engaged to a young man named Calkins, but was informed by him the night before that the marriage date, which had been set for an early day, would have to be postponed for three years at least, a disappointment which drove her to suicide. Her death occurred on the 18th anniversary of her birth.

Street car gossips, as the cars pass up and down Madison, Halsted, and other principal thoroughfares, have been saying things about the streets being so torn up again, and showering colored blessings on gas, water, telegraph, and telephone companies for sometime back on account of the vandalism. A knot of these philosophers, the other day, were fault finding in a very diffuse way, grumbling on general principles: "The streets were always torn up," "they were always dark," "we ought to have electric lights, and crush out the gas companies," etc.

When some one who was posted explained that these later diggings were for electric lights, that these lights were the city's lights, that the gas companies were to an extent being squeezed out of the streets, and that the streets would eventually be lighter, the general chorus went up in the words of a topical song: "Well, *that is* different."

Professor Barrett is laying electric light conductors on Michigan avenue, from the river to Jackson street; on Madison, from Michigan avenue to Ashland avenue; from Madison to Van Buren on South Halsted; from South Halsted to the river on Van Buren; on Desplaines, from Van Buren to Randolph; and on Randolph from Desplaines to Franklin. As far as the appropriation will permit, loops will be run from these main arteries into side or cross streets, and lamps placed at the most important points. All of the wires will be placed underground, and the members of the National Electric Light Association at the February meeting, will have an opportunity of witnessing the successful working of buried lines as they are worked in the rowdy west.

This plant is only the commencement of a series which is contemplated for a general illumination of the streets in the business part of the city, to be completed as rapidly as appropriations are made by the council. The city already has a plant of over 100 lights—all on underground lines—which light the river and its branches beautifully, while various central plants in the city are running about 2,000 arc lights in all—all on underground lines—and all doing "very well, I thank you ma'am." Come west, boys, come west, and tell us something about this underground business.

As suggested, the council committee on licenses made two reports on the telephone matter. Consideration of the two proposed ordinances was made the special order for the 8th of October. It was put over for one week on account of more important business, for, as one alderman expressed it, "there is to be a slugging match that evening."

The Chicago Electric Club will commence its semi-monthly meetings on the 8th of October.

C. C. H.

Chicago, Sept. 29, 1888.

OUR BOSTON LETTER.

(Special Correspondence.)

A preliminary prospectus of the New England Phonograph Company, a corporation to be organized under authority of the North American Phonograph Company and Jesse H. Lippincott, sole licensee of the American Graphophone Company, has just been issued by Mr. Samuel P. Hinckley, who has the matter in charge. The company will be organized with a capital stock of $2,000,000, divided into 20,000 shares of $100 each, and will be the exclusive licensee for the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut, of all phonograph and phonograph-graphophone patents of Messrs. Edison, Taintor, and Bell, together with all improvements which may be made thereon by those inventors, or either of them, or which may be acquired or controlled by the North American Company, or by Mr. Lippincott. After devoting a few pages to an outline of the phonograph and phonograph-graphophone, with which all readers of the REVIEW are familiar, and pointing out their practical uses and special advantages, an estimate of the probable business of the New England Company, carefully and conservatively compiled, is given, which shows a most promising prospect and one which will be speedily taken advantage of by New England capitalists. Offices have been secured in Rooms 7 and 10 of 66 State street.

A meeting of the Electric Club will be held at the Club Rooms this (Monday) evening at 8 o'clock. The question of a club house has been the main subject of conversation and discussion among members since the last meeting, and will doubtless receive special attention this evening. The prevailing opinion seems to be in favor of a permanent home for the Club, the points of difference at present being in regard to location of house and expense. An open discussion will largely aid in uniting all on some one plan, and it is safe to predict that at no far distant time the electric brethren from abroad will receive hospitable treatment in the Boston Club's own home, such as has made the name of the New York Club a familiar one throughout the country.

Among the recent electrical graduates of the Institute of Technology Class of '88, who are now filling responsible positions, are: Louis A. Ferguson, at the Edison central station in Chicago; Russell Robb and Charles A. Stone, with the Thomson Electric Welding Company, Lynn, Mass.; W. H. Blood, Jr., motor department, Thomson-Houston Company, Lynn, Mass.; Charles A. Peterson, instructor in department of electricity, University of Pennsylvania; F. H. Safford, instructor in Brewster Academy, Wolfboro', N. H.; J. C. T. Baldwin, assistant electrician with Mr. Farnham, N. E. Telph. and Tel. Company, Boston; G. E. Claflin, manager of the New England Office, "C. & C." Motor Company; S. C. Hathaway, Jr., agent Sprague Railway and Motor Company, Elmira, N. Y.

The Boston Aldermen have voted unanimously to grant the West End Railway Company the right to locate the overhead electric system of running horse cars into the city as far as Ipswich street, which is just beyond West Chester Park, and will be a great thoroughfare upon the completion of the new Cambridge bridge. The underground conduit system will be used from that point into the city. A curious point brought out by the hearing is that there has been a slight legal doubt as to the power of the Board to grant the use of the streets for poles on which wires are strung, but none at all as to the power of the Board to authorize the setting of poles. All the opponents of the granting of the right withdrew their opposition except one man, he being the remonstrant who declared on general principles against ever permitting anything but horses for street car motive power. President Whitney, of the West End Company, pledges himself that before September 1st, 1889, a conduit shall be substituted for the overhead system as far as the crossing of the Boston and Albany Railroad, providing a sewer is built in the meantime.

T. W. S.

178 Devonshire St., Boston, Oct. 1st.

An Inquiry into the Relative Value of Aluminium and its Alloys in the Arts.

BY H. PEMBERTON, JR., READ AT THE STATED MEETING OF THE FRANKLIN INSTITUTE, WEDNESDAY, SEPTEMBER 19, 1888.

There has been of late years a considerable amount of attention paid to the metal aluminium. A great deal has been written about it; many plans have been proposed for its extraction, and numberless patents, embodying these plans, taken out, both in the United States and abroad. In fact, the subject appears to possess a species of fascination, as it has attracted attention from all directions. Parties supplying the raw materials or chemicals used in the experiments report that the demand for such comes not only from chemists and metallurgists, but also from business men, lawyers, and professional men of all kinds. The long list of foreign patents on the subject shows how widely it attracts interest. Prof. Richards' treatise on aluminium contains 54 pages—one-sixth of the entire book—on the manufacture of the metal by processes other than the regular one of Deville.

There is no difficulty in giving an explanation of this. Of all the metals, properly so called, the compounds of which make up the crust of the earth, aluminium is the most abundant. This statement is literally true; there is no exception to it. It is evident, therefore, that there can be no difficulty in obtaining material to work upon. Now, taking ordinary clay as an instance, it can be readily shown that in every cubic yard there is at least 800 pounds of aluminium, the lowest recorded price of which is $5 a pound. Clay can be had, in many cases, at a cost not exceeding that of digging it out. The apparent profit can readily be calculated.

The practical outcome, however, of all of this work, and of all of these experiments, is that the only process by which any quantity worth speaking about, of the pure metal aluminium—in contradistinction to its alloys—has ever been extracted, is the process of Deville, established about a third of a century ago. Modifications in the preparation of the materials have, indeed, been made. But the main features of the process, and the sequence of operations, have remained unchanged. The large aluminium works now just about starting, near Birmingham, England, employ the same chemicals, and rely upon the same reactions that the French chemist did in the fifties.

This company—the Aluminium Company, Limited—has gone into the manufacture on a scale never heretofore approached. According to the descriptions in a number of English technical journals, the works comprise a plant of 20 furnaces for the manufacture of metallic sodium by the Castner process, with a total capacity of about 1,500 pounds a day; a set of 12 regenerative heating furnaces, containing 60 retorts for the manufacture of the double chloride of aluminium and sodium, turning out about 5,000 pounds every 24 hours; a Weldon chlorine plant; and furnaces for reducing the aluminium from the double chloride by means of the sodium. The total capacity of the works is about 500 pounds of aluminium daily. According to a late number of the *Chemical News*, the production of the entire world has heretofore not been over 50 pounds a day. It appears, therefore, that the new company can manufacture in five or six weeks as much as has hitherto been produced in a year. The selling price of the aluminium has been placed at about $5 a pound as against $11, lately. The reduction is due partly to the large scale of manufacture, but principally to the cheapening of the cost of the sodium by Mr. Castner's process. It is to be noted that the alumininm made by this company will be in the form of the pure metal unalloyed. If it is desired to produce alloys, they can only be made, or, at any rate, they have only been made by first manufacturing the metal and then alloying it.

Exactly opposite is the case with the Cowles electric smelting process. Here the aluminium has always been produced as an alloy, with either copper or iron The manufacture of the pure metal on a commercial scale does not appear to have been successful so far, and it is probable that the large demand for the alloys has prevented proper attention being given to this branch of the subject. There is no inherent reason why the metal itself should not be produced, but as a matter of fact, up to this date, such has not been the case.

There is one point connected with this process which is worth drawing attention to; that of the reduction of aluminium from its oxide in the presence of carbon, at a high heat. The discovery of this property of the element was as radical and as unexpected as the discovery of a new oxide would have been. All previous efforts to accomplish this had been utterly fruitless, so much so that the hope of so doing had been almost entirely abandoned. Only a few years before the Messrs. Cowles took out their patents, Mr. Walter Weldon asserted that it would be about as sensible to try to get five from two times two, as to reduce alumina by carbon. "Never prophesy unless you know," said Artemus Ward. This property of the metal is worth drawing attention to, as the practical results of the new process appear to have overshadowed a discovery very interesting from a scientific point of view.

The electro-smelting process appears to have been making great advances of late. A description of it was embodied in a report of the Committee of Science and the Arts of the Franklin Institute (this *Journal*, July, 1886). Since this report was published several improvements have been made. It has been found practicable to top the furnace and allow the molten metal to flow directly into the ladle or into slabs, instead of letting it cool in the furnace and then putting it cold into crucibles to be remelted. This has practically doubled the capacity of the plant. Another improvement has been in the use of beauxite, as well as corundum, for a raw material, thus ensuring an abundant supply of alumina. The works at Lockport, N. Y., have now two dynamos of 217 electric horse-power each, driven by water-power. The new establishment at Milton, England, has a 402 E. H. P. machine, put up experimentally and to be followed by others. Both of these works are reported to be running day and night.

It appears, then, that the aluminium industry has at length attained a firm footing and is well established. The two lines of manufacture differ essentially in their characteristics. One is a chemical process; the other a metallurgical. One produces the pure metal only, the other only its alloys. One is a complicated process, the other a simple one. Indeed, the Cowles process is extremely simple, consisting, as it does, of only the dynamo, with the power to drive it, and the application of its current to the mixture of carbon, alumina and the metal to be alloyed. Compared with this, the Deville process is a very elaborate one. Compared with any process, it is a very elaborate one. Indeed, it is doubtful if in the whole field of chemistry and metallurgy together there can be found any process which involves such an intricate series of operations as this one does. There is a department for preparing the alumina, a department for preparing the iron and carbon compound (Castner's patent), another for manufacturing the metallic sodium, another for re-working two-thirds of the sodium remaining as carbonate from imperfect reduction. (This, indeed, is done in an adjacent works, but has to be paid for, of course, just the same.) There is a department for manufacturing chlorine by the Weldon process; another for mixing the alumina, carbon and salt, moulding and drying the same; another for treating this mixture with chlorine at a red heat for the production of the double chloride of aluminium and sodium, and finally one for treating the double chloride with sodium, by which the alumina is reduced to metal. The manufacture of some high-priced organic compound—for instance, Fahlberg's saccharine—may approach this, but it is doubtful if it excels it. The Solvay process of manufacturing soda-ash has often been cited as one having had a long up-hill fight. But the Solvay process had the additional struggle of having to manufacture its product for less than two cents a pound, or else not at all, whereas metallic alluminium is sold for twice as many dollars a pound. It needs no expert to see that the cost of the aluminium in alloys, as made by the electro-smelting process, must necessarily be only a fraction of that of the metal made by the Deville. It follows, therefore, that the latter process will not be likely ever to compete with the former in the manufacture of alloys, but will have as its legitimate field the production of the pure metal. It is dangerous to assert a negative. But it is hard to see how there can be any escape from the above deduction. Perhaps a possible exception may be named in the case of certain alloys of aluminium and silver—such as *tiers argent* and a few others of like kind, used in table ware.

There are three properties, or characteristics of aluminium, that make it valuable in the arts. It is a light metal (sp. gr. 2.56), being about one-third as heavy as iron. It is a pretty metal, and not very readily acted upon by atmospheric influences. In this respect it rivals silver, which is blackened by sulphuretted hydrogen, by which aluminium is not affected. Upon exposure for some time, however, or by handling, the surface loses its brilliancy and becomes, through oxidation, more or less "dead," resembling tin or zinc, though superior to them, as the color is much whiter. In the third place, it is a fairly strong metal, about equal to brass. It is destined to play a valuable role in the manufacture of philosophical instruments. Prominent manufacturers state that the weight of theodolites, levels, compasses, sextants, etc., is about one-third less when made of it, and seem to think that there is no doubt of its being largely employed at the quoted English price. All the bearings and wearing surfaces of these instruments must still be made of brass, as aluminium is not hard enough. It is coming into use for making beams of chemical balances with a capacity up to as much as 200 grammes, and has long been used for the smaller weights. The moulds for casting such beams are the same as have been used for the ordinary bronze. Opera and field glasses, when made of it, are much lighter, and can be used with great ease and comfort. It cannot be employed for cooking utensils, as it dissolves easily in organic acids in the presence of chlorides, such as common salt (Roscoe). A few other uses in which the pure metal appears to advantage, are aluminium leaf, fine wire lace, certain surgical instruments, suture wire, dental plates, etc. Aluminium jewelry has failed to make any headway; it tarnishes too easily and becomes brittle.

It will be observed that nearly all of the above uses are for objects small in size. Many suggestions have been made for its use on the larger scale, as in aerial navigation, or for engineering and constructive purposes. Some of these are of a very sensational nature, as for example:

"The dead weight of trains could be saved by constructing freight and passenger cars of aluminium. * * * Ships larger than the "Great Eastern," with less draught, could be constructed nearly entirely of aluminium, including the machinery and boilers, which at present weigh down vessels seriously. * * * Railway beds, sleepers, ties, rails, bridges, and all, will be cast solidly in their places, with airy aluminium palace cars dancing over them 100 miles an hour or more," etc.

There is a fallacy involved in all such writing, which may be worth showing up. The writer's attention is pre-eminently attracted by the low specific gravity of the metal. When employed in any construction where it will be required to withstand severe stress, the metal with which it will immediately come into rivalry will be steel. The specific gravity of steel is almost exactly three times that of aluminium. Of course, an inch rod of the latter metal will, therefore, weigh only one-third as much as an inch rod of steel. But when we examine the tensile strength of the two, we find that steel has three times the strength of aluminium. It follows, therefore, that to make the aluminium rod of the same strength as the steel, it must be three times the size. The two rods will now weigh exactly the same. Where, then, is the advantage of the low specific gravity of the aluminium?

The extraordinary qualities of many of the aluminium alloys have long been known. The bronze is the strongest of cast metals, and when rolled, the strongest of rolled metals. Nor does it corrode as ordinary bronze does, and its fine golden color gives it a very pleasing appearance. Aluminium brass is noted for its great strength, for its extraordinarily high elastic limit, and for its cheapness. Being composed of equal weights of zinc, copper, and ten per cent. aluminium bronze, it contains only three and one-third per cent. of aluminium; hence its lower price.

Aluminium iron is now extensively used in the production of wrought iron castings (Mitis castings). That the fusing point of wrought iron should be reduced almost 500° by the addition of only one one-thousandth of its weight of aluminium, is another instance of the wonderful properties of this extraordinary metal. The effect of its addition to cast iron is shown in a paper on this subject by W. J. Keep. (This *Journal*, 126, p. 220.) Large quantities are now being used also with steel, a very minute amount ensuring the solidity of the castings. Indeed, it appears that aluminium will be used almost universally in the metallurgy of steel and of iron, including puddled iron. Its strength giving properties are extraordinary. There is hardly any metal with which it will not alloy. And it alloys with nothing that it does not improve. It would be only tedious to attempt to describe its endless applications. Two of the most important, however, may be noticed. The bronze is destined to play an important part in the manufacture of cannons. The war that is waging between experts, regarding the relative value of cast and of built up guns, is so fierce, that it appears difficult to obtain a discussion on the subject that does not involve the introduction of this pet fight. Aluminium bronze can, of course, be used for either type, although the cast gun is naturally much the cheaper. Such cannon could be made to possess almost any desired combination of properties, from 114,000 pounds tensile strength and five per cent. elongation, to 90,000 pounds and 10 per cent. and to 72,000 pounds and 47 per cent. The castings would be free from blow holes, could be poured at a comparatively low temperature, would be free from any separation of the ingredients or liquation and would therefore be of uniform composition throughout. The plant required to construct them would be simple compared to the elaborate establishments necessary in the construction of the steel guns of the built up type. Unlike these latter, the bronze gun, when worn out, could be melted and cast over again, as the value of the metal in them is about two-thirds that of a new gun. Aluminium bronze stands this treatment on account of the above mentioned freedom from liquation.

Aluminium brass is now being used by the United States Government for the manufacture of propeller blades for the new war vessels. Various metals have been used for this purpose. Cast iron is too weak, steel has some admirable qualities, but is very liable to corrosion, the average life of a steel blade being only four years. Ordinary bronze has been used, but is deficient in strength. Manganese bronze has, until lately, headed the list. Our Government, therefore, ordered the propellers to be made of this metal. Attention, however, was drawn to aluminium brass, and numerous comparative tests were therefore made, with the following results:

	Mang. Bronze	*Al. Brass*
Tensile strength per square inch, tons	29 — 31	34 — 50
Transverse strength per square inch, cwts.	28 — 52	75 — 85
Price per ton in ingots	£112	£103

The order for manganese bronze was accordingly countermanded, and aluminium brass adopted in its stead.

It is difficult to speak of these alloys without appearing to be guilty of extravagance; their quality is so uniformly excellent, their appearance so fine, their uses so many. But hundreds and hundreds of tests, similar to those above given have been made, both officially and in private, and the results obtained have invariably substantiated all that was claimed for them. The chemical process at Birmingham also has a wide future before it. It can hardly be said to have more than started as yet, and the introduction of its "silver from clay" will naturally require time. Much is owing to chemistry for what it has done in the extraction of this elusive metal. But it cannot be denied that the value of aluminium in the arts will be chiefly in its alloys, and that the greater debt of gratitude is due to that protean and subtle form of motion known as electricity.

A Unique Generator of Electricity.

TO THE EDITOR OF ELECTRICAL REVIEW:

I have made a curious little discovery which may interest your readers. It first occurred on a railway train. I happened to hold against the inside surface of the window glass a daily paper which had been cut by a saw-tooth cutter, leaving a ragged edge on which some of the bits were loose. When I removed the newspaper some of the bits remained clinging to the glass. It was curious, and I began to investigate with larger pieces. All would stick to the glass when laid against it. I took different kinds of paper then, but the results were the same. Since then I have repeated the experiment a great number of times on different railways, and always found the glass apparently electrified. It cannot be capillary attraction, as the most porous kind of paper, if light, will stick just the same. I have had pieces of newspaper two inches square hold firmly. And a strange thing, too, the phenomenon appears as certainly in rainy weather, even when the window panes are streaming outside. It seems to require a clean window for good results.

One evening I tested seven windows in one car, and had them all spotted with bits of paper, and my fellow travelers eyed me with suspicion as a result. Now, why does the paper stick? Is it the friction of the air outside? Hardly, because after a five minute stop, fresh paper will stick just as effectually. Is it due to the heat of the finger in applying the paper? No, because a lead pencil or a cork will do instead of the finger. Is it capillary attraction? I think not. I will be glad to have some of your readers investigate and report. Perhaps a pocket electroscope would help.

OBSERVER.

New York, Sept. 28, 1888.

Telephonic News

*** A bill granting right of way to the telephone company at Nashville is being considered by the council of that city.

*** The Portland, Oregon, and Vancouver Railroad Company, and the East Portland Electric Light Company, have both asked for franchises for telegraph and telephone lines in East Portland. The light company also desire to furnish light and power.

*** Electricity now pumps the church organ as well as lights the choir. If its use should become common for putting criminals to death, there is a wide range of activity, indeed, between blowing the bellows to accompany hymns of praise and acting as an extinguisher to snuff out a felon's life.—*Philadelphia Ledger.*

*** The October Term of the United States Supreme Court will convene on the ninth of the month. On the first day, as usual, the court will meet and adjourn almost immediately, but on the following day, the telephone cases, being the first coming over from last term, will come up for oral argument. It is understood that ex-Senator Thurman will be present, as he is one of the Government counsel.

*** The telegraph and telephone tax in the State of New Hampshire has been assessed for the current year as follows: Telegraph—Western Union, $1,938; New York Mutual, $25.84; Atlantic, $77.52; Northern, $64.60; Maine, $120.20; Great Northwestern, $64.60; Chester and Derry, $5.17; American, $25.84; Direct United States Cable, $129.20; $2,459.97. Telephones — New England Telephone and Telegraph Company, $1,744.20; Plymouth and Campton, $31.01; Brattleboro' and Hinsdale, $6.46; Brattleboro' and Chesterfield, $6.46; Stratford and Colebrook, $3.87; Colebrook, Stewartstown and Connecticut Lake, $19.38; Winnipesaukee Bell, $71.06; $1,882.44. The railroad tax is $238,652.38 against $216,447.89 for 1887. Telegraph tax, $2,459.97 against $2,385.88. Telephone tax, $1,882.44 against $1,714.93. Total tax, $242,994.79 against $220,548.70. Increase for the current year, $22,446.09. This increase comes from the larger average rate of taxation throughout the State, which has gone up from $1.38 in 1887 to $1.52 in 1888.

A Kiss Over the Telephone Wire.

Early one morning last week I chanced to be in the office of a wholesale merchant down town, at a time when the pretty little operator of the typewriter tumbled into a trap of her own making, says the Pittsburgh *Chronicle Telegraph Gossip.*

Such a pretty girl, with very blue eyes, bright brown hair, and an assortment of dimples, is this deft manipulator of the typewriter keys.

The telephone which hung on the wall just behind the girl, whose desk was close to her employer's, in his private office, rang loudly as I took a seat. I seized the opportunity to congratulate the merchant on his choice of so fair a secretary.

"Yes," said he in an undertone, "she is pretty, and she is as well behaved and quick at her work as she is pretty. The only thing I can complain of in her conduct is the hold that telephone seems to have upon her. She is engaged, I believe, to a nice enough fellow, a clerk in a broker's office, but he will persist in calling her up on the telephone. He called her up so often on Monday last that I told her she must tell the young man to wait until after business hours. She blushed, and said she would tell him.

"Since then—that was three days ago—apparently he has not been near the telephone, but, strange to say, Mary's—that's the girl's name—sister has taken to holding long conversations with her at all hours of the day. The noise disturbs me, but I don't like to interfere with the girl's domestic affairs. Just listen to her now!"

We did listen, and we heard something like the following:

"Charlie didn't come to see me."

An interval of silence.

"You know he called to see Kate."

Interval.

"What's that;" —— —— —— "Oh, nonsense; of course I shall go with you. Will you call for me? What did you say? Oh, Bob's going, too."

Interval.

"You can, if you like, but I just hate that girl, and if she's there I won't stay. Did you say 6 o'clock? Make it 6.30."

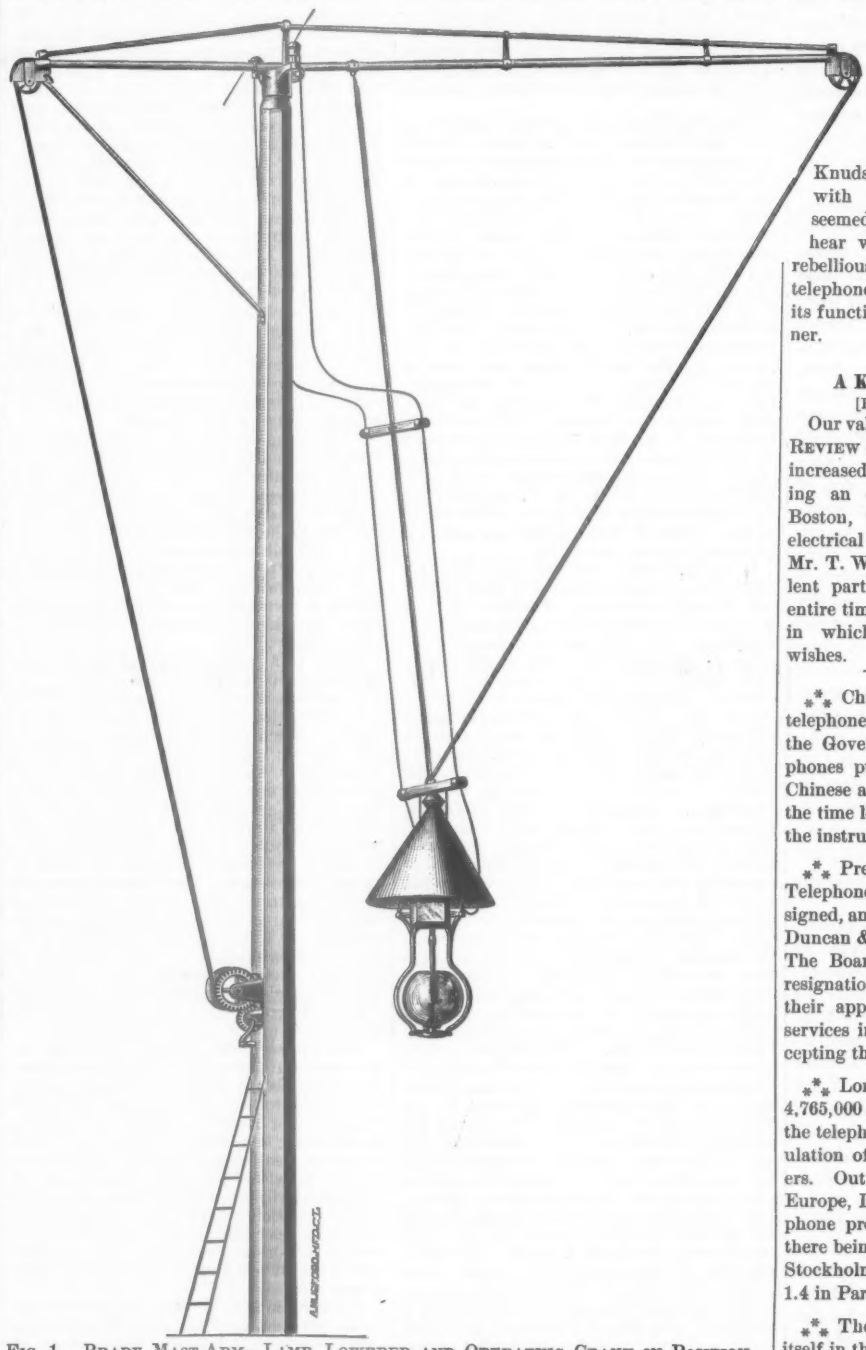

FIG. 1.—BRADY MAST ARM—LAMP LOWERED AND OPERATING CRANK IN POSITION.

Interval.

"I wish I could; it seems an awful long time to wait. Oh, you mustn't talk like that. Isn't there any one there?"

Interval, during which the girl, with the receiver at her ear, laughs and blushes by turns, and finally says titteringly: "Not one—I won't give you one, you bad boy."

She hung up the receiver without another word, and sat down blushing furiously.

"How is your sister this morning?" said the merchant, with an accent on the "sister."

But Mary answered never a word.

*** Telephonic communication was opened on Tuesday between Berlin and Breslau. The line is the longest in Germany, being 360 kilometers (about 220 miles). Every word was heard most distinctly in Berlin as well as in Breslau.

Do Not Swear Over Your Telephone.

The operator who has charge of that section of the board in which your brass flap is located, soon learns your peculiarities. If your calling arrangement vibrates long and vigorously every time you call, she of course puts you down as an irascible sort of individual. Again, if you are one of the men who always growl at "Central," want to know why she doesn't hurry up and so on *ad infinitum*, she puts that down, too, in her mental note book, says the N. Y. *Mail and Express* man, who has been studying the question. It may be that she ought to take particular pleasure in promptly attending to that sort of a subscriber, but it would be contrary to human nature if she did. Anyway, the next time you want to swear at "Central," just wait a bit; go down to the exchange and find out just what she has to do and how often she has to do it. If you do this you won't swear at her in the future, provided you are a reasonable individual. For you will find that the exchange attends to about 10,000 calls from its 500 subscribers each day. This would mean an average of thirteen calls from each subscriber daily, but as a matter of fact, some subscribers, as, for instance, newspaper offices and big business houses, daily make or receive scores of such calls.

Even on the average basis each operator attending to 65 subscribers, would attend to 800 calls were she on duty day and night. The operators only work from 8 A. M. to 6 P. M., but the bulk of telephone business is between those hours. And, probably, each day operator attends to 600 calls per day. Taking out her recess time of one hour, she works nine hours, and at this rate would answer one call a minute. Beside answering the call she must replace the cords and apparatus used by you in getting the desired communication. So she is scarcely over-burdened with spare time. When you think of the monotony of her work, the constant confinement and the nervousness of such constant, trying labor, you may be a bit more considerate in your future treatment of her.

Telephonic Cure of Deafness.

The following interesting information is from Mr. A. A. Knudson, the provincial telephone manager. An application was, one day, received from a young woman, by Mr. Knudson, for a position as operator on the Truro, N. S., telephone exchange. The girl, as it afterwards turned out, was deaf in one ear, but the fact was unknown to Mr. Knudson and she was duly engaged. After several months the operator informed Mr. Knudson of her former deafness, with the statement that the deafness seemed to be gone and that she could hear well with each ear, the previously rebellious auricular upon which the head telephone had been used, now performing its functions in a perfectly satisfactory manner.

A Kindly and Generous Notice.

[From *Modern Light and Heat.*]

Our valued contemporary, the ELECTRICAL REVIEW of New York, has responded to its increased business in New England by opening an office at 178 Devonshire Street, Boston, which building is a well known electrical center. This office is in charge of Mr. T. W. Sprague, a young man of excellent parts, who in future will devote his entire time to the interests of the REVIEW, in which enterprise he has our best wishes.

*** China is coming to the fore with the telephone. The Viceroy of Kouang and the Governor of Canton are having telephones put up between their offices. The Chinese are evidently going to make up for the time lost in the past, and then think how the instruments will suffer.

*** President Noel, of the Cumberland Telephone and Telegraph Company, has resigned, and Mr. W. M. Duncan, of the firm of Duncan & Page, Nashville, has been elected. The Board of Directors, in accepting the resignation, passed resolutions expressing their appreciation of Mr. Noel's valuable services in behalf of the company since accepting the presidency in May, 1888.

*** London, with a population put at 4,765,000 contains only 4,193 subscribers to the telephone, while Stockholm, with a population of only 215,000, has 4,832 subscribers. Out of 12 of the principal cities of Europe, London stands last but two in telephone progress, the average of subscribers there being 0.9 per 1,000, as against 2.25 in Stockholm, 6.4 in Rome, 3.3 in Berlin and 1.4 in Paris.

*** The telephone company is bestirring itself in the matter of putting the downtown wires underground, says the Cleveland *Plaindealer.* Its bond indemnifying the city for possible damages in laying the conduits was filed with the mayor and accepted. The amount is $20,000. The company will begin work in about 60 days, as the pipes and conduits will not be received from the manufacturers before that time. The territory in which all wires will be buried during the next year is as follows: Superior street, from the Cuyahoga River to the west side of Monumental square; Seneca street, from the Cuyahoga River to Lake street; Champlain street, from Seneca street to Ontario street; Ontario street, from Champlain street to south side of square; south side of square, from Ontario street to Euclid avenue; east side of the square, from Euclid avenue to Superior street; Superior street, from east side of the square to Erie street.

SOUTHERN ELECTRICAL NOTES.

(Special Correspondence.)

At Greensboro, North Carolina, the gas works have added an electric light plant, and have now a capital stock of $75,000.

High Point, North Carolina, a town of 2,500 inhabitants, is desirous of having electric lights, and Mr. E. D. Steele, of that place, would like to correspond with some capitalist in regard to the erection of this plant.

At Anniston, Alabama, the Woodstock Iron Company have greatly improved and added to the machinery of their electric light plant.

The Columbia, South Carolina, Electric Light Company have the frame of their building ready, and the dynamos and other plant are *en route*.

The loss of Mr. C. A. Leffingwell's electric light plant by fire at Shreveport, La., last week, was $16,000. It will shortly be rebuilt.

The De Soto Oil Company, at Memphis, Tenn., will put electric lights in their cotton-seed oil mill, and have contracted for machinery with capacity for 40 sixteen candle-power lights.

The Electric Light and Power Company at Decatur, Ala., will soon enlarge and improve their plant.

The Columbia Telephone Company, at Covington, Tenn., capital stock, $10,000, has been chartered.

The Norfolk & Western Railroad Company, at Roanoke, Va., are putting in a telephone exchange.

An electric light plant is now in course of erection by the Troy Fertilizer Company, at Troy, Alabama.

At Meridian, Miss., the Waterhouse Electric and Manufacturing Company have a proposition to erect a plant with a capacity of 75 arc lights.

The United States Electric Light Company, at Louisville, Ky., has been damaged by fire to the extent of $10,000. Repairs will commence at once.

The Columbia Electric Light and Power Company, at Columbia, Tenn., and the Greenville Electric Light Company at Greenville, Tenn., have each been chartered, and will soon erect plants.

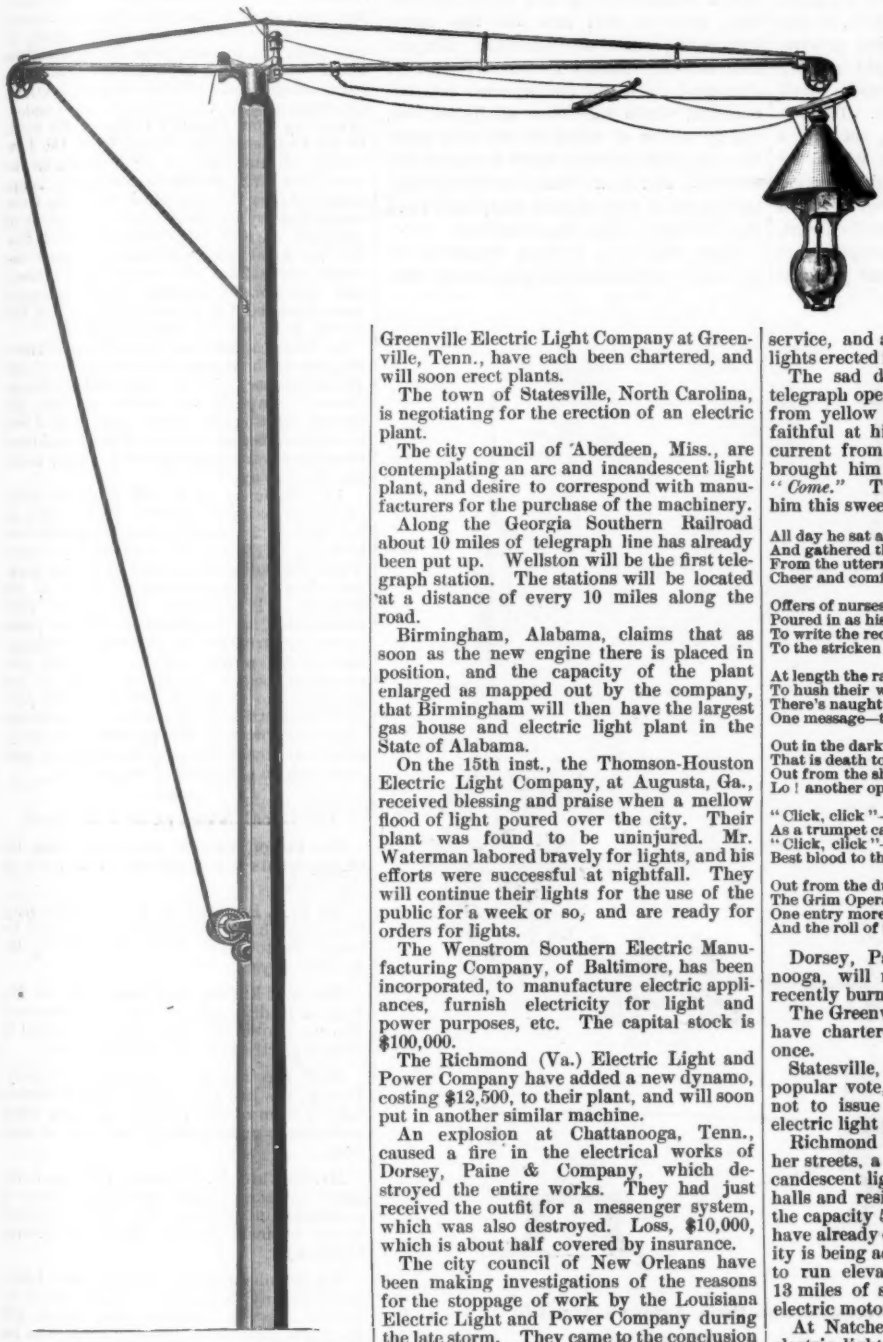

FIG. 2.—LAMP RAISED AND IN POSITION.

The town of Statesville, North Carolina, is negotiating for the erection of an electric plant.

The city council of Aberdeen, Miss., are contemplating an arc and incandescent light plant, and desire to correspond with manufacturers for the purchase of the machinery.

Along the Georgia Southern Railroad about 10 miles of telegraph line has already been put up. Wellston will be the first telegraph station. The stations will be located at a distance of every 10 miles along the road.

Birmingham, Alabama, claims that as soon as the new engine there is placed in position, and the capacity of the plant enlarged as mapped out by the company, that Birmingham will then have the largest gas house and electric light plant in the State of Alabama.

On the 15th inst., the Thomson-Houston Electric Light Company, at Augusta, Ga., received blessing and praise when a mellow flood of light poured over the city. Their plant was found to be uninjured. Mr. Waterman labored bravely for lights, and his efforts were successful at nightfall. They will continue their lights for the use of the public for a week or so, and are ready for orders for lights.

The Wenstrom Southern Electric Manufacturing Company, of Baltimore, has been incorporated, to manufacture electric appliances, furnish electricity for light and power purposes, etc. The capital stock is $100,000.

The Richmond (Va.) Electric Light and Power Company have added a new dynamo, costing $12,500, to their plant, and will soon put in another similar machine.

An explosion at Chattanooga, Tenn., caused a fire in the electrical works of Dorsey, Paine & Company, which destroyed the entire works. They had just received the outfit for a messenger system, which was also destroyed. Loss, $10,000, which is about half covered by insurance.

The city council of New Orleans have been making investigations of the reasons for the stoppage of work by the Louisiana Electric Light and Power Company during the late storm. They came to the conclusion that it could not have acted otherwise without having endangered both the lives and property of citizens. The small wires, dead and otherwise, blown down from poles and tops of houses, were liable, of course, by contact, to carry off the full force of the current, and spread it dangerously broadcast. It would seem unjust to hold the electric light company responsible for what they could not possibly prevent.

Mr. James M. Gardiner, the agent of the Gamewell Electric Alarm Company, is now in the city of Charleston, S. C., arranging the police electric alarm service. The entire machinery has not yet arrived; the balance, however, is expected in a few days. It is stated that it will require three weeks for the entire business to be consummated. The lines were arranged some time since, and this will greatly facilitate the business in hand.

The city council of Augusta, Ga., are considering the placing of electric lamps to light up the way to the exposition grounds. It is estimated that an extra expense of $1,000 only will be required to light the way, and this is insignificant in comparison with the additional safety and convenience of visiting multitudes.

At Columbus, Ga., on the 14th inst., the electric light wires and the fire alarm wires got mixed up, and several alarms of fire were thus accidentally sent in. One of the horses of No. 4 engine was knocked down by the current. The electric light wire burned the alarm wire in two, and caused considerable confusion.

At Petersburg, Va., on the 15th inst., a clerk in the drug store of Mr. Wm. E. French, on Sycamore street, was severely shocked by electricity. There is an incandescent electric light wire that runs up through the soda fountain, and which conveys electricity to an ornamented lamp on the fountain. When the clerk was in the act of turning the faucet to draw a glass of soda for a customer, he was quite severely shocked by electricity. The electric current from the wire had not only been conveyed to the faucets, but also to the metal slab on the counter. Even the sponge used in cleaning was charged with electricity. The electricity was so strong for several days, that Mr. French had it turned off.

The Birmingham Gas and Illuminating Company has a new 300 horse-power engine, together with several car loads of machinery, to be used in enlarging the capacity of the electric light and gas plants. The company proposes to double the capacity of the plant. The stack will be 80 feet high when completed. Twelve more gas retorts will be brought into service, and a large number of arc electric lights erected in different portions of the city.

The sad death of Mr. H. L. Robinson, telegraph operator of Jacksonville, Florida, from yellow fever, comes to us. He was faithful at his post till the great electric current from the source of all electricity, brought him his last message, which was: "*Come.*" The Atlanta *Constitution* pays him this sweet tribute in verse:—

All day he sat at the rattling key,
And gathered the tidings of land and sea;
From the uttermost corners of the land,
Cheer and comfort flowed under his hand.

Offers of nurses and money, too,
Poured in as his fingers fairly flew
To write the record of man's good will
To the stricken city of Jacksonville!

At length the rattling keys begin
To hush their wild remorseless din;
There's naught to be done but to send away
One message—the death rate of the day!

Out in the dark, in the yellow mist
That is death to the lips it has silently kissed;
Out from the shadows where microbes crawl,
Lo! another operator's call!

"Click, click"—it comes as cold and clear
As a trumpet call in the startled ear;
"Click, click"—in the terrible silence his heart's
Best blood to that fateful summons starts!

Out from the dusk where the shadows crawl,
The Grim Operator has sent his call!
One entry more on the tally sheet,
And the roll of the dead is at last complete!

Dorsey, Paine & Company, of Chattanooga, will rebuild their electrical works, recently burnt.

The Greenville, Tenn., Electric Light Co. have chartered, and will build works at once.

Statesville, North Carolina, will decide by popular vote, on October 8th, whether or not to issue $8,000 of bonds to erect an electric light plant.

Richmond has, in addition to lights on her streets, a company supplying 2,200 incandescent lights in factories, stores, offices, halls and residences, and who are increasing the capacity 5,000 to accomodate those who have already engaged these lights. Electricity is being adopted there for motive power to run elevators, presses, etc. There are 13 miles of street railway operated by the electric motor.

At Natchez, Miss., a few weeks ago, an electric light company was established, and all the stock at once taken, and the company has received a part of the machinery. A second company is now forming to give electric lights to the city, and it has an agreement with the Thomson-Houston Company, who has an agent there now.

At Sumter, S. C., the city council is agitating the question of electric lights and it is thought that they will decide to have the lights.

At Birmingham, Alabama, a stock company is now being formed for the purpose of erecting an electric light plant to supply lights for the people living on the South Highlands.

Many new improvements and repairs have been added to the Western Union Telegraph Office, at Birmingham. In the rear of the building, the large battery room is now cut off by a partition, and the 700 cells have been placed in position. The wires enter the office from the front by means of a large cable that is carried through the basement. Improved lightning arresters have been put in, and three sets of repeaters. The work has been done under the direct supervision of Col. Flenn, who has few equals as a lightning manipulator. Col. Flenn left, a few nights since, for Atlanta, where he goes to superintend the removal of the office in that city to a more central location.

EDWARD A. OLDHAM.

Charleston, S. C., Sept. 24, 1888.

TELEGRAPHIC

.... The French telegraph operators are on a strike.

.... The Mexican government telegraph lines are in a terrible state on account of the late storms. Almost entirely new lines will be necessary.

.... A despatch from St. John, N. B., says: Judge Tuck, in a carefully prepared judgment, refused to dissolve the injunction obtained by the Western Union Telegraph Company on August 1st, restraining the Canadian Pacific Railroad and Telegraph Company from building a telegraph line on the right of way of the New Brunswick railway between Vanceboro' and St. John.

The Improved Brady Mast Arm for Electric Lights.

Mr. T. H. Brady, the mast arm inventor, of New Britain, Conn., has improved his work, and, as a result of years of experience in electric street lighting, now presents a mast arm that he claims is unexcelled. It is very durable, can be easily lowered and raised, and is very convenient for trimming. It is made to extend 15 feet from the curb to center of the lamp, and acts as its own brace to the pole, being so attached and proportioned as to bring equal leverage on each side of the pole. It is so arranged that only employés can operate the lamp, and it is impossible for one to fall. Mr. Brady is so well convinced of the advantage of his mast arm that he will send one on trial to respon sible parties, to be paid for only if satisfactory. The illustrations we present will interest every user of the electric arc lamps.

Sprague Electric Transfer Table.

Since the last issue of the ELECTRICAL REVIEW the Sprague Electric Railway and Motor Company, of New York, has closed a contract with the Pennsylvania Railroad for the construction of an electric transfer table at the works of the latter company at Altoona, Pa.

The electric power will reach the table by an overhead wire from a dynamo located in the main engine room of the shops.

The motor is guaranteed to move weights of 100,000 pounds at a rate of 300 feet per minute.

The Sprague Company will furnish motor and gearing, dynamo and all the electrical equipment for this installation. The table itself will be furnished by the Yale and Towne Manufacturing Company.

The Sprague Company some time ago put in a similar plant at Aurora, Ill., for the C. B. & Q. Railroad, which is operated by a dynamo in the main repair and construction shops, situated about 750 feet away from the table. This motor moves weights of 100 tons with quickness and dispatch, and its successful operation has been the direct cause of the order from the Pennsylvania road.

The "Puritan" to be Well Lighted.

The contract for lighting the large new steamboat of the Old Colony Line, the "Puritan," has finally been awarded the Edison Company, through Mr. Charles A. Benton, the active New York agent. The lighting capacity will consist of four 400 light (16 candle-power) dynamos. The power plant for the lighting will consist of two "Straight Line" engines, furnished through Messrs. Williams & Potter, of New York.

This makes the fourth boat of the Old Colony Line lighted by the Edison Company, the other three being the "Bristol," the "Providence," and the "Pilgrim," the Armington & Sims engine being used on these three boats.

The "Puritan" is the largest steamboat ever built, and will be elegantly fitted up, and it is safe to say that the electric lighting part will be of the finest.

The Westinghouse Electric Company is to enter the electric street railway business, and will use the Tesla Motor.

The stock for an electric railroad between Cottage City and Vineyard Haven, Mass., is said to be all subscribed, and the road will be built before the opening of another season.

The American Institute of Electrical Engineers will meet to discuss Mr. Sprague's paper on "Municipal Rapid Transit," Tuesday next, at 8 P. M. The meeting will be held at the rooms of the American Society of Civil Engineers on 23d street.

A syndicate has bought the Mt. Auburn Street Railway, together with the Main street Inclined Plane, Cincinnati, and intends to build an electric railway at once. The cars are to be carried over the inclined plane and run out to the Zoological gardens. Some overhead system will be used.

The Electric Road at Scranton.

The work on the People's Line, Sprague system, at Scranton, Pa., is being pushed forward as rapidly as possible, and all the cars will be put in operation before long. The contract calls for the equipment of 20 cars with overhead wiring.

The People's Line is the largest in the city of Scranton, and operates over 12 miles of track with more than 100 horses. The power station for operating this road will be one of the finest in the country, with great steam and electrical capacity. An item of great importance is the cheapness of the fuel which will be used for generating the power. This fuel is "culm," or anthracite waste, which can be obtained in Scranton at the rate of 10 cents a ton, which has been proved to have at least 75 per cent. the steam producing capacity of the best anthracite coal.

With this cheap fuel, electric power can be produced at a very low expense, and it is the intention of the company to furnish outside parties with power at a very low price by means of electric motors, as well as to furnish enough for their own cars.

The Thomson-Houston Company will also put an equipment in this city on the Suburban Line, so that both this system and the Sprague will soon be running side by side.

Manufacturing Notes.

The Complete Electrical Construction Company, of New York, is what its name implies, and is one of the ablest of those organizations, electrically and substantially, that have come to the front to meet the growth in electrical circles. With experts and practical men, whose experience has taught them all branches of the rapidly developing business, they are sure to meet a constant demand for their services, now that they have decided to enter the general field.

Messrs. W. D. Allen & Co., 151 Lake street, will hereafter have control of the Chicago branch of the New York Belting and Packing Company. Messrs. Allen have for a number of years done an extensive business in leather belting for the account of Fayerweather & Ladew, and this connection with the largest rubber belting, packing and hose manufacturers in the world, will no doubt greatly add to their influence and prosperity.

Mr. F. B. Rice, of the John T. Noye Manufacturing Company, of Buffalo, manufacturers of the Rice automatic cut-off steam engines, who was a delegate to the recent convention, has since been engaged in starting two compound condensing engines of his make at Yonkers, N. Y., where they will be used for electric lighting purposes. The Rice engines are furnishing the power for a portion of the electric lights at the Minneapolis Exposition, and also for a part of the electrical apparatus at the Exposition in Buffalo. The trade is spreading in a manner very satisfactory both to Mr. Rice and the John T. Noye Company.

Electric Transmission of Power.

We publish an extract from the address of Professor Ayrton, F.R.S., delivered in Bath, September 8th, 1888, in which the subject of electric transmission of power was exhaustively and interestingly treated:

But it is possible to use a very large potential difference between the main wires by means of which the electric power is economically conveyed a considerable distance and transformed into a very small potential difference in the houses where it is utilized. An electric transformer is equivalent to a lever, or wheel and axle, or any other of the so-called mechanical powers. You know that a large weight moving through a small distance can raise a small weight through a large distance. There is no gain in the amount of work, but only a transformation of the way in which the work is done. A large weight moving through a small distance is analogous with a high potential difference and a small current, while a small weight moving through a large distance is analogous with a small potential difference and a large current; and an electric transformer is for the purpose of effecting the transformation with as little loss as possible, so that what is lost in potential difference may be all gained in current.

Electrical transformation may be effected by:

1. Alternate current transformers.
2. Motor dynamos.
3. Accumulators, or secondary batteries.
4. Direct current transformers.

Of these apparatus the eldest by far is the alternate current transformer, as it is merely the development of the classical apparatus invented by Faraday in 1831, and familiar to many of you as the Ruhmkorff or induction coil. A combination of a motor and dynamo was suggested by Gramme in 1874. Accumulators are the outcome of Planté's work, while direct current transformers are quite modern, and not yet out of the experimental stage.

After studying the literature on this subject, it appears, as far as I have been able to judge, that the first definite proposal to use a high potential difference in the street mains and transform down to a low potential difference in the houses was made in the lecture given by me at the meeting of the British Association in Sheffield in 1879, on which occasion I explained and showed in action the motor dynamo principle suggested by Professor Perry and myself. The apparatus on the platform is not unlike that shown on the former occasion. An Immisch motor, working at 500 volts, and with a current of 6.8 amperes, is geared direct to a Victoria Brush dynamo giving five times that current, and we will now use this larger current to produce an electric fire. (Experiment shown.) Messrs. Paris and Scott have combined the motor and dynamo into one machine, which they have kindly lent me, and by means of which we are now transforming about 700 volts and 6.8 amperes into 100 volts, and about 40 amperes used to light that group of incandescent lamps and work these motors. (Experiment shown.)

Lastly, here is a working illustration of the double transformation proposed by MM. Deprez and Carpentier in 1881 by means of which, while the potential difference between the mains may be two or 10,000 volts if you like, not merely is the potential difference in the house so low that you could hardly feel anything if you touched the wires, but, in addition, there is the same security against shocks in the dynamo room. This alternate current machine is producing about 50 volts, which is transformed up to 2,000 volts by means of this transformer. At the other end of the platform by means of a similar transformer the 2,000 volts is transformed down again to 50 volts employed to light that cluster of low voltage incandescent lamps. I have to thank the Anglo-American Brush Company for the loan of this apparatus. (Experiment shown.)

In this experiment there is, as a matter of fact, still more transformation than that I have yet mentioned, because whereas in actual practice the alternate current dynamo, as well as the small dynamo used to produce the current for magnetizing the electromagnets in the alternate current dynamo, would be worked by a steam, gas, or water engine, I am working them both by electromotors, since a steam engine or a water wheel would be an unsuitable occupant of the Drill Hall. Practically, then, a steam engine on the land belonging to the Midland Railway Company on the other side of the Lower Bristol road is driving a Thomson-Houston dynamo; this is sending a small current working these high voltage constant current Immisch motors. The motors being geared with low voltage dynamos the potential difference is transformed down, the first alternate current transformer transforms it up again, and the second alternate current transformer transforms it down again, so that there are, in fact, three transformations taking place in this experiment on the platform before you. (Shown in the REVIEW's illustration.) A vast district in London, extending from Regent's Park on the north to the Thames on the south, from the Law Courts on the east to Hyde Park on the west, has over 20,000 incandescent lamps scattered over it, all worked from the Grosvenor Gallery in Bond street, by means of alternate current transformers, which convert the 2,000 volts maintained between the street mains into 100 volts in the houses; and this London electric supply company have arranged for a vast extension of this system to be worked from Deptford.

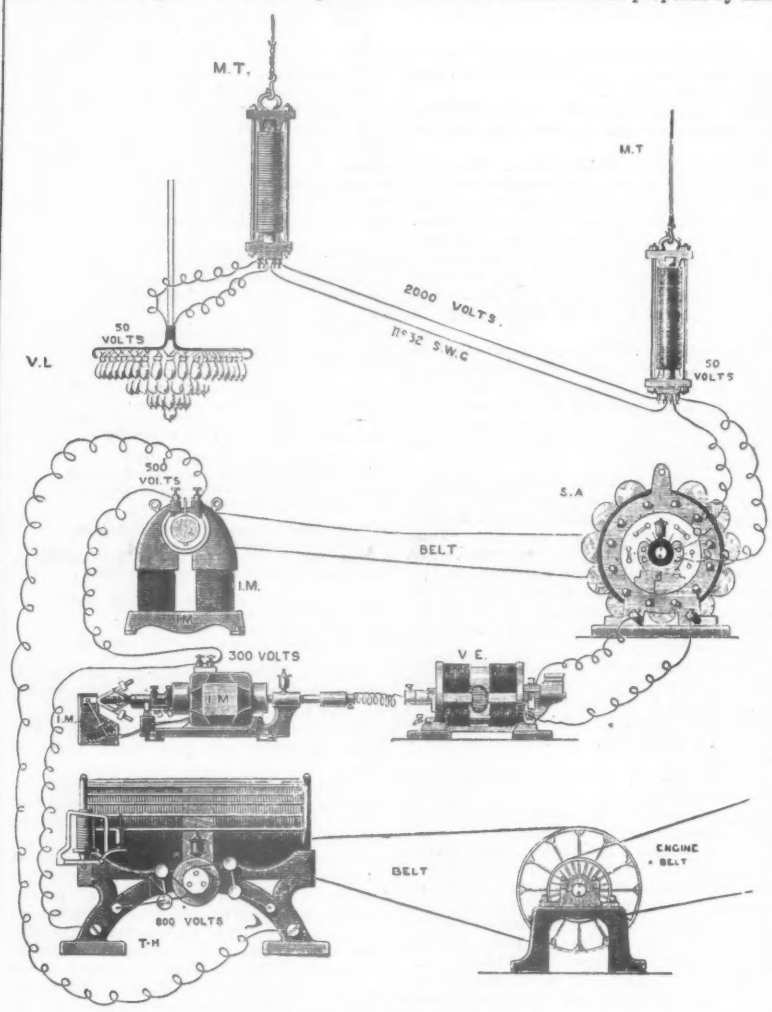

ILLUSTRATION ACCOMPANYING PROF. AYRTON'S ADDRESS.

T.-H Thomson-Houston Dynamo
I. M. Immisch Constant-Current Motors with Governors
V E Victoria Exciter
S. A. Siemens Alternator
M. T. Mordey Transformers
V. L. Victoria Lamps (forty-five of 10 candle-power.)

In America, alternate current transformers are, due to the remarkable enterprise of Mr. Westinghouse, used to light 120,000 incandescent lamps in 68 towns; in fact, the electric lighting of a whole town from a central station begins to excite less astonishment than the electric lighting of a single house did 10 years ago.

The efficiency of a well made alternate current transformer is very high, being no less than 96.2 per cent. when the transformer is doing its full work, and 89.5 per cent. when it is doing one-quarter of its full work, according to the experiments made by our students. It certainly does seem most remarkable, and it reflects the highest praise on the constructors of electrical machinery, that motor power can be converted into electrical power, electrical power at low pressure into electrical power at high pressure, or electrical power at high pressure into electrical power at low pressure; or, lastly, electrical power into motor power—in each case with an efficiency of 94 per cent.

Electrical Notes of New England.

The Boston Electric Club has a long list of applicants for admission to be acted on this week.

Mr. J. N. Pratt, of the Jarvis Engineering Company, has been making flying trips between Boston and New York during the last few days.

The well-known face and form of Mr. Eugene Phillips, of the American Electrical Works, Providence, have been welcomed in Boston electrical circles the past week.

The Electric Gas Lighting Company, Boston, has just received a new dry Samson battery from the Paris manufacturers which promises to make a stir in this line of business.

Mr. Howard M. Crowell, of Lynn, is the latest addition to Mr. Spaulding's force of assistants in pushing the New England motor business for the Thomson-Houston Company.

Mr. Burnham, of the Electric Gas Lighting Company, is shortly to start on an extensive western business trip, which will keep him away from the city of Boston for several weeks.

The Baxter motor agency, Boston, is kept busy supplying motors and information to prospective users of electric power. New uses for electric power are brought to light daily. Among the more recent is one where a small motor is running a machine for the manufacture of Saratoga chips.

A hearing was given at Lowell on Friday evening by the aldermanic committee on streets, upon the petition of Warren Aldrich and others, for permission to set poles and string wires on the public streets for electric purposes. The petitioners wish to introduce low tension electric power, and the Edison incandescent light. Among the speakers were Mr. J. J. Pickman, representing the petitioners, Mr. Warren Aldrich, Mr. Paine, of the Boston Edison Company, Mr. G. F. Richardson, representing the Middlesex Electric Light Company, Mr. Edward Blake, of the New England Sprague Motor agency, and Mr. W. F. Kelly, the local representative, urged the advantages of the Sprague motor. Mr. Frank Ridlon was present representing the Baxter Motor Company, and spoke at length in favor of the motor he represents. Mr. Hollon C. Spaulding represented the interests of the Thomson-Houston Company, and urged their claims for electric power business. After a rather lengthy discussion and questioning, the hearing was closed.

Electric Power for the Sultan of Turkey.

The Sultan of Turkey has had an electric dog cart made for him, a view of which we give our readers in this issue of the REVIEW. The cart was built by Messrs. Immisch & Co., at a cost of $1,000. It is similar in appearance to an ordinary four-wheeled dog cart, but, of course, has no shafts, the fore carriage being modified to carry a toothed rack, which engages with a pinion attached to a shaft passing upward through the foot-board and terminating in a handle, by means of which the carriage can be guided with the greatest facility. The carriage is provided with an ordinary foot brake. It is constructed of walnut and light wood, bright varnished; the cushions of brown cloth are embroidered with the Turkish Imperial crest. The power is stored in 24 small accumulators of special type, which contain a charge sufficient to propel the vehicle for about five hours at a speed of 10 miles.

The motor is Messrs. Immisch & Co.'s one horse-power type, using in this case a current of 20 amperes, with an electromotive force of 48 volts. When the vehicle is running at a speed of 10 miles an hour the motor makes 1,440 revolutions per minute, and develops ¾ horse-power. The weight of the accumulators is about 7 cwt., and the weight of the carriage complete 11 cwt.

On an ordinary road the amount of work required, of course, varies with the up-hill or down-hill gradient, and the total amount of work done is thus, on an average, about the same as on level road. The current required to start is about 25 amperes, and for very heavy gradients as much as 45 or 50 amperes could be taken for a few minutes without harm. The motor has been tested up to 90 amperes.

The dog cart carries four persons; it is started, stopped, and guided without any difficulty by means of a switch with three resistances, and a steering gear fitted to the fore-carriage, with a handle for the driver. Messrs. Immisch may be complimented on having produced a really serviceable electric carriage, not merely a king's toy, says the *Electrical Engineer*, London; and we shall expect to see very important developments in commercial usefulness result from their continued work upon the Sultan's electric dog cart.

Edison's Yellow Fever Preventive—Gasoline.

Thomas A. Edison, since the middle of last month, has been conducting a series of experiments in order to discover some cheap and effective way to destroy the germs of yellow fever. "That the germs are carried in the air is a ridiculous idea, because the fever would at once spread all over a district," he said to a *Tribune* reporter. "And just as plainly are the germs organic and not inorganic, because their spread is always stopped by the coming of cold weather. I am, therefore, forced to one of two conclusions—either the fever germs must be animal organisms or they must be fungus growths.

"I believe that the fever microbes are parasites which crawl along the ground, as in several instances their spread has been known to have been stopped by street pavements. I first began experimenting in 1878 to find some chemical to destroy the Colorado beetles. I tried every kind of chemical substance on the beetles, and found gasoline to be the most effective. As we have not had yellow fever germs, we have been experimenting on insects which are extremely tenacious of life. A glass jar was filled with moulding sand, and at depths of 7, 16, 19, 24, 26 and 30 centimeters from the surface, little cell prisons were made with their open ends against the glass. Ants were placed in these cells, and a layer of gasoline .06 centimeters in thickness was poured on the surface of the sand. The 7 centimeter ants died at the end of 15 minutes, the 16s at the end of 19 minutes, the 19s after 40 minutes, and in three hours all were apparently dead except the lowest, or 30 centimeter ants, which appeared stupefied. However, the next morning the three lowest grades had recovered. Satisfactory experiments were also made on clams, earthworms and cheese mites.

"The only way to stop the spread of the disease is to put a cordon of gasoline around the infected place. If that don't stop it, nothing can. It would cost $24 to sprinkle a street 250 long by 60 feet broad with gasoline, and that would kill everything in the soil. Caustic soda should be used in damp places. A square yard could be covered with caustic soda to a depth of one-eighth of an inch for one and one-half cents, and no organism could possibly survive it. In a room heated to 82 degrees Fahrenheit a coat was dipped in rhigoline, and in 15 minutes the temperature of the coat fell to 23 degrees, and the coat was covered with hoar frost. Now, as cold weather is known effectually to destroy the fever microbes, this would prove an effective way of disinfecting clothing, as the rhigoline will evaporate within half an hour.

"Experiment has shown that after the gasoline has been applied for 10 minutes it soaks into the soil and there is no danger of its becoming ignited. A whole year has been wasted, which should have been given to experiments on the means of checking yellow fever at the South. I shall have a microscope, costing $1,500 or $1,600 in a few days to use in these investigations. If the blocks where the fever broke out in Decatur and Gainesville had at once been surrounded by a cordon of gasoline or caustic soda, $500 expended in this way in each place would have prevented the panic."

Reducing Gold Ore by Electricity.

TO THE EDITOR OF ELECTRICAL REVIEW:

Some time ago there appeared a very interesting article in regard to the reduction of sulphurous gold ores cheaply by some process in which electricity formed a part. I gave my number away at the time, and now I would like to know where I could get fuller details in regard to it. I have mining property that would be of great value were the contents of that article true.

Yours truly,
GEO. H. CURRY.

Prescott, Arizona, Sept. 24, 1888.

—— The Atlantic Cotton Mills, Lawrence, Mass., have increased their Waterhouse electric plant of 45 arcs purchased last year, giving the Waterhouse Electric and Manufacturing Company, of Hartford, Conn., an order for 77 arcs additional. As but few lights are used during the bright days each working day during the year, a practical test has been made of the Waterhouse regulator, which has given excellent satisfaction.

THE ELECTRIC DOG CART MADE FOR THE SULTAN OF TURKEY.

Personal.

Mr. W. A. Giles, formerly connected with the Edison Company, has accepted a position with the Sawyer-Man Company.

F. B. Knight left for Texas last week, where he wrestles with telephone problems in all forms, with headquarters at Austin.

The marriage is announced of Mr. Geo. B. Prescott and Miss Frances R. Cooley at Pittsfield, Mass., October 2d. Mr. Prescott's large circle of electrical friends will extend hearty well wishes.

Mr. C. W. Brown, of the Bell Telephone Company of Canada, came down from Montreal last week, and spent a few days in New York visiting electrical friends and inspecting new electrical apparatus. His visit was extended to Chicago, where the extensive works of the Western Electric Company were inspected.

Mr. A. B. Uline, the telephonico-politico philosopher of Albany, was a New York visitor last Wednesday. The day he left Albany an earthquake scared the inhabitants of that city, and as it came so closely on the departure of Mr. Uline, his telephone friends think it was the result of the vacuum his absence caused. Anyhow he hurried back to Albany the next day, and the earthquake passed on.

—— The Salem Electric Light Company has extended its lines to Peabody, and the streets of the latter place were lighted by electricity last week for the first time.

—— Easthampton, Mass., is to be lighted with the Waterhouse arc lights, the People's Electric Light Company of that place having placed their order for a plant with the Waterhouse Electric and Manufacturing Company, of Hartford, Conn.

—— A young man named L. H. Leber, "not yet 21," is reported in Philadelphia as having invented an electric lamp that burns at any "desired brilliancy from one candle-power to 100 candle-power." Does the amount of current used figure in this invention, we would gently inquire?

—— The Boston office of the Sawyer-Man Electric Company is making a record in installation contracts. Among those already consummated are the following: Henry Adams, Rockville, Conn., 50 lights; T. K. Earle Mfg. Co., Worcester, Mass., 210 lights; George G. Page Box Co., Cambridgeport, Mass., 175 lights; Saxon Worsted Co., Franklin, Mass., 100 lights; Glasgow Co., South Hadley Falls, Mass., 450 lights; Nonotuck Silk Co., Lawrence, Mass., 750 lights; Grosvenor and Richards, Saugus, Mass., 100 lights; American Tool and Machine Co., Boston, 50 lights; Jaffrey Mill, East Jaffrey, N. H., 325 lights; Goodyear Metallic Rubber Shoe Co., Naugatuck, Conn., 100 lights addition; Nelson Mill, Winchendon, Mass., 300 lights; Madison Mills, Madison, Me., 600 lights; Berlin Iron Bridge Works, East Berlin, Conn., 100 lights.

ELECTRIC LIGHT NEWS

—— The Brush Electric Company have recently sold to parties in Princeton, N. J., a 225 light incandescent plant complete.

—— The East Portland, Oregon, Electric Lighting Company has its plant erected, and will be in working order very soon. Power is obtained at the falls at Oregon City.

—— J. B. Converse, agent for the Brush Company, has completed a contract with the citizens for illuminating Truckee, Cal., with electricity. The plant will be in operation by October 1st.

—— S. & J. C. Atlee, of Fort Madison, Iowa, have recently increased their electric light plant by purchasing from the Brush Electric Company, of Cleveland, Ohio, a number of arc lamps.

—— The Brush Electric Company have sold to the Brown Hoisting and Conveying Machine Company, of Cleveland, Ohio, a large arc and incandescent electric light plant for their works.

—— Work is progressing rapidly on the new electric light plant near First and Jefferson streets, Oakland, Cal. The foundation is already laid, and it is hoped to have the plant in running order in a few months.

—— The Jamestown, N. Y., Electric Light and Power Company has increased its number of trustees from five to ten. The additional trustees are C. W. Grant, C. H. Tew, Frank N. Stevens, Edward L. Hall, and Edward Sharer.

—— The town of Versailles is to be lighted by electricity by an electric light company having its station at Marly, seven miles away. A high tension current will be brought to Versailles and distributed by means of transformers.

—— The San Antonio Gas Company, of San Antonio, Texas, have just added to their electric light plant by purchasing another 30 light 2,000 c. p. arc dynamo from the Brush Electric Company, Cleveland, Ohio. This plant is a new one installed within the last year. They are now operating 150 Brush arc lights.

—— Lawyer Dykman, counsel for the Brooklyn Bridge Trustees, states it is a close question whether the United States authorities have any power in the matter of lights on the Brooklyn Bridge. He will give his opinion in the matter to President Howell soon. The latter said that he failed to see how the lights interfered with navigation in any respect, and he says: "I believe the question was brought about by a crank. It would put the Bridge to a great deal of trouble and expense to place shades on each light, and we will not do so unless we find that the Government has the power to compel us."

—— A Kentucky physician suggests the following cure for yellow fever, claiming that the poison in the air is so delicate and subtle that it can be dissipated by strong light: "If this is a fact," says the doctor in a communication to Surgeon-General Hamilton, "I am of the opinion that if a row of large army tents were spread along the center of some street in Jacksonville for the inhabitants to take refuge in, after having been thoroughly disinfected, with a sufficient number of electric lights arranged near the ground on either side of them (the wires of course, being well grounded), that the lights could be made so intense as to repress the poison and stay the destroyer." After having given the subject much thought, the doctor is "very decided in his convictions that it is of sufficient merit to be tested," and he does not doubt that Congress would make the necessary appropriation, "provided eminent scientists can agree as to the feasibility of the suggestion."

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPTEMBER 17, 1888.

389,870 Registering meter for electric currents: James D. Bishop, San Francisco, Cal.

389,876 Electric motor; Philip Diehl, Elizabeth, N. J.

389,882 Secondary battery; Camille A. Faure, New York, N. Y., assignor to the Electrical Accumulator Company, of New York.

389,883 Telegraphy; Stephen D. Field, Yonkers, N. Y.

389,888 Electric incandescent lamps and attachments; Isaac W. Heysinger, Philadelphia, Pa.

389,894 Dynamo armature; William G. Meyers, Philadelphia, Pa., and Frederick E. Coward, Camden, N. J.

389,928 Dynamometrical governor; Julian A. Hurdle and Andrew W. Steiger, New York, N. Y., assignors to Helen F. Hurdle, same place.

389,935 Electric storage system; William H. McDonald, Albany, N. Y.

389,943 Electrical conductor and insulating conduit; Robert F. Silliman, Troy, N. Y.

389,974 System for the distribution of electric energy; Gustav Pfannkuche, Exeter, N. H., and Alfred Pfannkuche, Cleveland, Ohio.

390,001 Elevated frame work and support for electric wires and street railways; Linus W. Brown, New Orleans, La.

390,058 Telephonic, telegraphic and signaling circuit; Edmond I. Bernheim, Paris, France.

390,062 Angle hanger for telephone line; Robert C. M. Bowles, Boston, Mass.

390,067 Galvanometer; Isaac W. Chisholm, New Concord, Ohio.

390,081 Railway alarm; Aaron G. Inghram, Omaha, Neb.

390,101 Electric testing device for card flats: Edmund Tweedale, Accrington, County of Lancaster, England, assignor to John Bullough, same place.

390,113 Electric testing device for carding machines.

390,115 Electric current indicator; Patrick B. Delany, New York, N. Y.

390,180 Dynamo electric machine; William Mather and Edward Hopkinson, Manchester, County of Lancaster, and John Hopkinson, Westminster, England.

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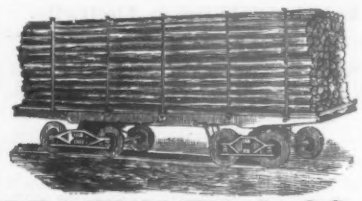

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THE VIRGINIA ELECTRIC LIGHT & POWER COMPANY, OF RICHMOND, VA.
NEW YORK OFFICE, 63 WALL STREET.
New York, August 21st, 1888.

A. F. MASON, Esq.,
SIMPLEX ELECTRICAL CO.,
Boston, Mass.

Dear Sir:

I have been using the Simplex Wire on a large portion of our lines in Richmond, Va., for the past five months. I have taken daily tests of the insulation during that time. The longest single circuit I have is about five miles, and at no time has the insulation test ever been less than one megohm. I cannot speak too highly of the wire or its insulation. A large portion of it has been run through foliage and trees in the streets, and upon examination a few days ago I failed to find any place where the wire has been abraded by coming into contract with the branches of trees. My instrument does not measure over one meghom, and I cannot tell how much higher the insulation may have measured. One megohm on wires in circuit is euough for me.

Yours very truly,
W. H. COLE, *Superintendent.*

THOMSON-HOUSTON ELECTRIC CO.,
AUGUSTA, GA.
August 12th, 1888.

Dr. A. F. MASON,
SIMPLEX ELECTRICAL COMPANY,
328 Washington St., Boston, Mass.

Dear Sir:

We are using in our arc-lighting circuits about twenty (20) miles of your Simplex T. Z. R. wire.

We have feund the insulation a most perfect protection against moisture and the abrasion of small tree limbs.

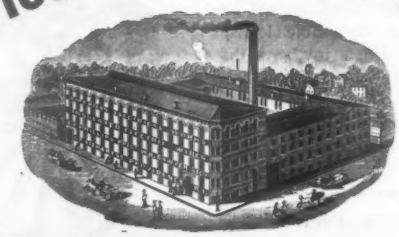
Have used your wire in our station, for running through trees, on buildings and porches, under mouldings, etc., and through cellars, and we have never been able to discover a "ground" upon any circuit since our plant was put into operation.

Very truly yours,
JOHN H. WATERMAN.

ADDRESS,
The Simplex Electrical Co.,
328 WASHINGTON STREET, BOSTON, MASS.

EUGENE F. PHILLIPS, PRESIDENT. W. H. SAWYER, SEC'Y AND ELECTRICIAN.

American Electrical Works



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